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The Journal of

Applied Psychology

Vol. I MARCH, 1917 No. 1

EDITORS

G. STANLEY HALL JOHN WALLACE BAIRD

L. R. GEISSLER

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WORCESTER, MASS.

FLORENCE CHANDLER, Publisher

The Journal of Applied Psychology

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THE JOURNAL OF APPLIED PSYCHOLOGY is published quarterly. The subscription price is $4.00 a year. Single numbers $1.25. Remittances and business communications should be addressed to Florence Chandler, Publisher, Clark University, Worcester, Mass.

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THE
JOURNAL OF APPLIED PSYCHOLOGY

VOL. I MARCH, 1917 No. 1

Published quarterly, in March, June, September and December.
Edited by G. STANLEY HALL, JOHN WALLACE BAIRD, and L. R. GEISSLER.
With the assistance of the following co-operating editors:

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such as climate, weather, humidity, temperature; also such conditions as nutrition, fatigue, etc.

(d) The psychology of everyday activities, such as reading, writing, speaking, singing, playing games or musical instruments, sports, and the like.

In reply to several inquiries the editors wish to state that those mental tests which aim to deal with purely educational problems or abnormal minds do not as a rule fall within the scope of the JOURNAL.

Each issue of the JOURNAL will contain about one hundred pages; the subscription price will be $4.00 per annum, or $1.25 per copy. Payments of subscription, advertisements, reprints, etc., should be remitted to Miss Florence Chandler, Publisher, Clark University, Worcester, Mass.

The JOURNAL is privately financed by the editors; and until it becomes self-supporting they request that co-operating editors and contributors shall accept and support the following terms:

Contributors will be expected to pay the costs of cuts, and the excess cost involved in the setting of tabular matter. If contributors re-write their contributions when proof-sheets are submitted to them, they will be expected to pay the printer's bill for re-setting, the editors agreeing to pay costs amounting to five per cent. of the original cost of composition. Three copies of the JOURNAL will be furnished to each contributor; reprints will be supplied at cost. As soon as the JOURNAL becomes self-supporting, or as soon as the present excessive prices of paper and printing abate, the above terms will be made more liberal.

To Co-operating Editors. It is hoped that every co-operating editor will contribute reviews or summaries of books and articles; they will receive free copies of the JOURNAL, at least during the first year.

To Contributors of Original Articles. Since the JOURNAL aims primarily to cover the field of practical applications of psychology, the editors suggest that articles should not exceed ten printed pages (about forty-five hundred words); the extreme limit is twenty pages. It is suggested that technical

descriptions of apparatus and methods be avoided, that tables and cuts be used sparingly, and that emphasis be laid upon clear and accurate statement of results, together with their practical applications.

To Publishers. The editors request that books and monographs dealing with topics which lie within the field of the JOURNAL be sent for review. Such books sent us will be at least mentioned by title, and the more important of them will receive extended reviews. Copies of the JOURNAL, or clippings containing reviews or notices, will be forwarded to publishers from whom books have been received.

To Reviewers of Books. The editors suggest that reviewers should adopt the following procedure: First present a brief, concise and sympathetic epitome of the essential content of the book under review, employing the author's language so far as possible, and stating his chief conclusions with the greatest fidelity possible; then in a second paragraph the reviewer may add his own comment or criticism. The type of alleged review which consists in a series of running comments upon the general topic in question, without any systematic endeavor to present the author's position, will not be welcomed by the JOURNAL.

A limited number of exchanges with other journals in allied departments will be accepted; and the list of exchanges will be revised from time to time.

Communications and Mss. may be sent to any one of the three editors; reviews, summaries, notices, books and articles for review should be addressed to Dr. L. R. Geissler, Clark University, Worcester, Mass.

FOREWORD

The past few years have witnessed an unprecedented interest in the extension of the application of psychology to various fields of human activity. Teachers and administrators of educational affairs were among the first to realize that the findings of the psychologist may be of value in the solving of practical problems; and the voluminous and growing literature of educational psychology testifies to a widespread belief that psychology is a valuable asset to the educator. Within the past decade one finds increasing evidence, in various quarters, of an equally widespread but more recent conviction that a knowledge of psychology is no less serviceable in the practice of medicine, in the administration of justice, and in various other pursuits. And attempts are now being made to apply the principles of psychology to the solving of problems in such widely divergent disciplines as history, religion, sociology, art, politics, and language.

But perhaps the most strikingly original endeavor to utilize the methods and the results of psychological investigation has been in the realm of business. This movement began with the psychology of advertising,—where at a relatively early date investigators attacked the analytic problem of determining what psychological factors are concerned in the 'appeal of the advertisement,' and the practical problem of utilizing and controlling these factors more judiciously and effectively,—but it soon spread to the adjacent field of salesmanship. The endeavor to discover what mental qualities contribute to success in salesmanship has gradually led to an attempt to analyze mental equipment into fundamental qualities or traits, and to discover the significance of each of these qualities as factors in determining successful achievement. Thence the attention of the applied psychologist turned to the more comprehensive and fundamental problem of vocational selection,—the question, namely, of making a detailed inventory of the equipment of mental qualities possessed by

a given individual, of discovering what qualities are essential to successful achievement in a given vocation, and thus of directing the individual to the vocational niche which he is best fitted to fill.

The growing impetus of this movement may be observed in various quarters; and the workers in this field are clamoring for more effective methods of diagnosing character and intellectual equipment. These clamors are either wholly unheeded by the psychologist, or are but partially and inadequately satisfied. Yet the problem which is here concerned is one which must appeal to the interest of every psychologist who besides being a 'pure scientist' also cherishes the hope that in addition to throwing light upon the theoretical problems of his science, his findings may also contribute their quota to the sum-total of human happiness; and it must appeal to every human being who is interested in increasing human efficiency and human happiness by the more direct method of decreasing the number of cases where a square peg is condemned to a life of fruitless endeavor to fit itself comfortably into a round hole. The problem, therefore, is one which touches the psychologist not only as a scientist but in his relations to his fellowmen and to the practical concerns of life; and it is equally of interest to various groups of non-psychological workers,—employers of skilled labor, employees, sociologists, criminologists, moralists, legislators, administrators of justice and many others. The problem is so far-reaching that one finds it difficult to determine whether the burden of its significance attaches to its psychological, its economic, or its social aspects. The psychologist finds that the old distinction between pure and applied science is already obscured in his domain; and he is beginning to realize that applied psychology can no longer be relegated to a distinctly inferior plane.

There already exist a number of journals and a number of associations which have been established to serve the interests of psychology. But none of the existing journals devote themselves to the task of gathering together the results of workers in the various fields of applied psychology, or of

bringing these results into relation with pure psychology. And while the programs of the psychological conventions are largely occupied with the discussion of practical problems, the reports of these discussions appear only in the technical journals and scarcely ever reach those laymen who are most interested in these questions.

In view of all of these circumstances the undersigned have decided, not without hesitation, to launch a Journal of Applied Psychology,—their hesitation being of financial origin because they have no pecuniary resources in hand or in prospect, excepting their own. They hope that the JOURNAL OF APPLIED PSYCHOLOGY (a) may bring together the now widely scattered data in this and other countries; (b) may gather from the various industries and from other practical fields data which shall be of real value for pure psychology; (c) may indicate new applications of psychology to the arts and to the occupations of human life, to which psychologists have hitherto made but little contribution.

G. STANLEY HALL.
JOHN WALLACE BAIRD.
L. R. GEISSLER.

PRACTICAL RELATIONS BETWEEN PSYCHOLOGY AND THE WAR[1]

G. STANLEY HALL

Rash as it may seem to draw any lesson as yet from the present war, in which the great Nordic race which embraces the dominant elements in all the belligerent nations is committing suicide, the following points, which can be only hinted at in my twenty minutes, seem to me worthy of consideration here.

Mr. Hafner, through whom most of us receive our foreign periodicals, writes, "About one thousand French and German scientific publications have suspended as a result of the war, and about half of those that remain have been issued less frequently or in reduced size." They have also suffered in quality because so many collaborators doing the best work have been sent to the front, and many of them wounded or killed. About all the research being now carried on is in the medical field and in hospitals. Since April last practically all continental publications have been kept out of this country. This affects not only our journal clubs but cuts us off from the stimulus of European thought, so that we are now the only great country in the world where research can go on as before.

Last month I asked and obtained the responses of representative authorities of all the twenty-four universities in the American Association concerning this situation. The responses were very diverse. One prominent university president amplified the view that it was high time and would do good for America to be weaned from its European alma mater. Another held that the cessation of importation of intellectual goods made in Europe would cause the culture level not only in academic departments but throughout the world to sink to a lower level. Most, however, held that this shortage will be a new and serious responsibility upon American scholars to make it good, that the present situation is a loud, clear call to independence, an opportunity for new leadership, that it should result in higher standards of originality and increased output of investigation, that the war opens

[1] Address prepared for the twenty-fifth anniversary of the American Psychological Association, New York, December, 1916.

opportunities to American universities as great as it has afforded to certain industries here, and that we should emulate the latter in devising new methods and in vastly enhancing our output. If we only have the vision the war will bring here a great advance in culture. The new Research Council of the National Academy and the Committee of One Hundred, with their splendid if as yet unrealized program, indicate that we are at least making a feeble beginning to respond to the situation. A vast deal has been said and written about research here within the last eighteen months, and there is every prospect that it will have at least enough, let us hope not too much, organization.

As for psychology, whether we regard the quality or quantity of work done here in every field, all the way from introspection to behaviorism, including the study of animals, children, normal and subnormal, anthropology, especially as represented by our Bureau of Ethnology, the work in tests, scales, in standards, and indeed in about every domain of psychology (unless we except psychiatry, where most work worth while that has been done has been inspired either by Kraepelin or more lately by Freud), I believe we are quite ready to meet this call in the field of both pure and applied psychology, provided only we escape the obsession of finality in either method or result and realize that psychology is just beginning, the best things are yet to be found out, and that its difficulties and obscurities are the twilight of dawn and not that of evening.

2. Another effect of the war upon psychology that now seems probable is to lay new stress upon applied as distinct from pure aspects of research. For two and a half years, practically all the leaders in most of the physical sciences, particularly physics and chemistry, have ceased to advance their science as such and have been absorbed in making it immediately serviceable; while even in the most humanistic fields culture has yielded to *Kultur*. The criterion of values in science is now what it can do pragmatically, in the Vaihinger sense. Talent of the order of Edison or Burbank has taken precedence over that of men like Helmholtz and Weismann, and the work of the latter is transvalued by the test of utility. The war has given the world its greatest lesson in scientific efficiency. Just as Russia in the war with Japan did not begin to realize how far the latter country had moulted all its pre-Meji and indeed all liberal culture and focussed its entire energy upon practical efficiency, so none of the Entente Allies, least of all England, realized how far Germany had gone in

casting off the culture of half a century ago, and in almost a single generation acquiring a new soul that made it, instead of the least, the most hard-headed, practically effective nation the world has ever seen, with hardly a vestige of the old, speculative, sentimental traits of the days before 1870. As pure chemistry failed to appreciate the value of the formula for making nitrate, which Germany had secretly bought from its Norse discoverer, and which enabled it to produce three hundred thousand tons of ammunitions during the first year of the war, at one-third its cost to the Allies, so its tests of the sense, motility, fatigue; its establishment of distinct digestive, respiratory, muscular, and nervous types; its temibility tests, which eliminate from the ranks both on donning the uniform and after every wound, thereby greatly reducing liabilities to panic; the French tests and assignment of men to infantry, cavalry, artillery, aviation corps, etc., according to the standard types of McAuliffe, Segaud, Thooris and Sorel, have shown how immediately serviceable psychology could be made in a new field. Already enough of the carefully guarded military secrets of these tests for specific lines of military service have leaked out to suggest why the German and French armies are so much more effectively organized than the English and Russian, and to show that applied psychology can render the most valuable service. We see with mingled admiration and dismay to what lengths Germany will go in applying all the latest knowledge in every field, not only in industry, municipal social organization, and even in eugenics, in ways often far beyond the reaches of the old morality. Corporation schools, which here in the last four years have come to represent the advanced line of vocational discrimination and guidance, have already demanded of psychology vastly more knowledge of character and its traits than it has yet attained; and this has led, as we all know, to very many tables of human qualities, that are, some more, some less, scientific, and premature, so that we can only very imperfectly and tentatively answer all the questions that business is now putting to us. So the war has still more urgently called upon psychology to do things it was not ready for, which had to be done extemporarily and as best they could by intuition. In both fields the call is so loud and insistent that it seems to me every psychologist should be able to give some reason if he does not do what in him lies to a better knowledge of man and life under modern conditions, even if he has to break in some degree from his own lines of work, in order to help in the supreme problem of diagnosing each individual, and steering him toward his fittest place, which is

really the culminating problem of efficiency, because human capacities are after all the chief national resources. In conning only a few of the some three thousand books and pamphlets on the war our library has made a specialty of collecting, only one topic has impressed me more than the literature that enumerates the various things which psychology is doing or can do, not only for war itself, but for the new social and industrial order which characterizes the state of a nation in war. Must we not, therefore, infer that such facts as these suggest that we read just the old differentiation between pure and applied psychology, and realize that research in the latter field may be just as scientific as in any other, and that the immediate utility of our results is at least no longer a brand of scientific inferiority?

3. We shall surely have a new and larger psychology of war. The older literature on it is already more or less obsolete from almost every point of view, and James' theory of a moral, and Cannon's of a physiological, equivalent of war seem now pallid and academic. More in point are the reversionary conceptions of Freud, Pfister and Patrick, that it is more or less normal for man at times to plunge back and down the evolutionary ladder, and to immerse himself in rank, primitive emotions and to break away from the complex conventions and routine of civilized life and revert to that of the troglodytes in the trenches, and to face the chance of instant death when the struggle for survival is at its maximum in the bayonet charge. Lahy, Crile and perhaps a score of others described, on the basis of much observation and insight, the stages of this recessional. First is the general perturbation at home when mobilization is decreed, the fraternization of all classes, normally more or less aloof; the rank credulities and superstitions that suddenly arise and spread by psychic contagion, often to the clearest heads and coolest hearts, on the basis of high expectant tension; the mad rumors, fears, suggestions, often so painfully acute that the call to arms is a relief.

Second comes the parting from home and loved ones; the donning of the uniform and with it the *esprit de corps* of the army; the intense activity of the training camp; the remarkable development of powers of effort and of endurance, which makes each often a marvel to himself, a power by which those from sedentary life often excel laborers and peasants; the games, songs, theatricals, often camp newspapers, in which phenomena we see instinct seeking to compensate, in Adler's sense, for a deeper but repressed anxiety. Life at this stage

is so absorbing that the old life at home pales, and loved ones are thought of with surprising infrequency, and it becomes harder to write to them; the sudden setting up, physical and often moral, of flabby individuals, to sleeplessness, heat, cold and hunger, as the individual learns to draw upon his phyletic reserve, and is often surprised to find the largest drafts upon it honored.

Third, in the advance into the trenches, where silence and immobility are often necessary under the greatest excitement, breaking down many a nervous system, and when everything else, past and future, is forgotten in the struggle for present safety and physical comfort, the long confinement and constrained positions interspersed with digging, bailing water, with sometimes personal draftings to carry despatches or rescue wounded friends from the "hell-strip" between the most advanced opposing lines, the acute attention to the sound of projectiles and their explosion, it is no wonder that some grow mad and rush wildly at the enemy and to certain death, or else back to safety, while those with stronger nerves develop with amazing suddenness a callousness to danger, fatigue, hunger, discomforts, while we sometimes have the unique reaction of sudden fraternization with the enemy which Kreisler has so well described.

Fourth, when the charge is called, some drop, fatigued and perhaps dead from exhaustion, while others who thought themselves entirely spent marvel at the sudden development of utterly unexpected resources in their own systems. Here each faces his man intent only upon killing him and escaping from being killed himself. When this is all over the survivors frequently, and sometimes for days and weeks, live in an illusion that the charge is still on, and they cut, slash, stab imaginary enemies, while the same obsessions haunt their sleep, so that even the hospitals, a few days after the battle, are noisy with the imagined battle which still rages in the soul. Those who have once had this experience, too, we are told, should recover within the hearing of the big guns, lest these obsessions undermine their courage and make them cowards and panic-starters despite their will. Only very slowly do even the sanest come back to full realization of what and where they are, what doing, and only gradually do their friends, relatives and home conditions live again in their souls as the past validates itself in the all-absorbing present.

Such, too, is the unprecedented strain of the present war, with its high explosives, the contractions of both time and space, poisoned gases, the fatigue and demoralization deliberately planned by each enemy by continuous day and night

bombardment before the infantry advance, that it is no wonder that each belligerent has had to develop a new type of hospital for cases of shock due to these causes. All agree that the nervous system of the belligerents has never been subjected to such a strain, and many hold that this of itself will impair the quality of parenthood perhaps for generations. War is a grim and awful experiment upon human nature, but like vivisection, disease and insanity, it should be studied intensively to find its nature, cause, and if possible its cure and at least its function for the individual and society. The very voluminous data in this field now fairly cry out for more and better interpretation. Raw instinct, feeling and emotion, which are the very roots of human nature, are stripped bare of all their disguises. The motivation of war, however interpreted, is psychological, whether its cause be individual, social, economic, or religious. War is still regarded too much as panics and pestilences were before science explained and controlled them. Hence it is that we should welcome the suggestion lately made of a society planned, to be given an international organization, to study the psychological aspects of this war, selecting literature, making special observations, according to prescribed methods, synthetizing results from all fields, in order that in the end we may have some definite conception of what war really is, does and means. At least the vastness and abundance of the data should not cause them to be negelected, seem common, or go to waste.

4. Will the war tend to increase collectivism at the expense of individual activity and initiative? It stands forth already as the most perfect example the world has ever seen of completely organized teamwork. The individual is only a cog in a vast machine. The subaltern and even the lower officer knows almost nothing, and indeed one high authority has told us that only three men in one of the leading belligerent countries know anything in regard to the general military plan; and very few attempt to understand what is going on in other parts of the line in any front. The rest obey literally, trusting in the wisdom at the top. They do much and perhaps have to face almost certain death in an enterprise that seems to them utter folly, and they have no consolation save their faith that the leaders know it to be for the good of the whole. This is necessary for all effective armies, but in citizens of an autocratic government it comes easier and is more complete than in those pervaded by the spirit of democracy. This, of course, is one of the reasons why wars always favor autocratic and are unfavorable to democratic institutions. This concentra-

tion of power often includes the civic community and almost anything may be committed, forbidden, commandeered, while personal liberty suffers from countless encroachments. So mechanized is war to-day that there is ever less opportunity for brilliant *coups*, acts of self-initiated heroism and daring. So, too, the *esprit de corps* of the army is strong and rigid in enforcing its collective judgment and sentiment, while if internationalism declines, patriotic and perhaps fanatical nationalism is incalculably strengthened. Thus it is no wonder that when soldiers are at last discharged and go back to civil and industrial life, they find it hard to readjust. They have lost positions to others who have gained while they have declined in aptness for their old jobs. Instead of the closer tie of companionship in arms there remains only that of fellow-citizens. They have grown used to taking orders, to being fed, clothed, cared for, and so find it hard to return to doing these things for themselves, and expect governmental consideration in the form of pensions, offices and other favors. They lean on the state that they have served, instead of learning to begin to exercise their own individual powers. In all these ways war is unfavorable to the spirit of democracy and more favorable to monarchical tendencies. A few new and powerful leaders arise because a few men have learned to exercise command, while the masses have learned to obey. War is as necessary for monarchy as peace is for a democracy. One over-emphasizes order, system, control; the other magnifies beyond bounds unrestrained personal liberty. Here is the issue of the present struggle. Germany never had a revolution such as in England and in France swept away the spirit and even the vestiges of feudalism, which Teutonic genius has conserved and transformed into something which at least the neutral world must admire. The least governed people can perhaps best understand the most governed, and yet here our psychology fails to recognize the fact that it is pre-personalities they have made history, and that it is their synthetic organization, one with another, that has created civilization and culture, and that if these elements or units in the body politic, social and industrial, have their freedom, repressed according to any wisdom the wit of man has yet devised, the whole of which they are members is sure, sooner or later, to lose the all-originating power of free and progressive development. Despite the penalties of freedom, such as license, sometimes degenerating to vice and crime, despite disorder, crude, often unsuccessfully and at best oft-repeated trial and error methods, if we believe in man and in a future that is to be greater than the present, we must

believe that the American way will lead mankind to an ever higher goal of evolution and emancipation from the countless repressions that dwarf and stunt him in the home, the school, church, industry and state. The German superman is for the people an irridescent dream evolved in order to compensate for the fact of over-institutionalized life, and even the superstate there is the state that now is, while our super-man and state is that which is to be when individual freedom has done its perfect work.

Finally, in view of all this, should we not in this country, along with all our other psychologizing, foster as something especially germane to the spirit of our institutions the study of individualities and racial and all the other very diversified groups which constitute our heterogeneous population, and do so not only for the development of anthropological science, but with the ideal of fitting each one's aptitudes of body, health, native gifts, traits of character, experiences and motor patterns, to just that occupation that best fits his own psychophysic organism, striving to guide each to that environment, industrial, social or cultural, in which his personality will find most incitement to unfold freely? Should not one of our ideals be to give each the kind and degree of self-knowledge that will make not only for maximal self-reverence and self-control, but for maximal freedom and the most efficient life? If a democracy achieves greatness it must be not by the method of regimentation or any kind of organization imposed from without, but by finding the place in life for which each is best fitted. Must we not study individuals more than we study vocations, and thus perhaps some day may not the very apex of democratic society be found in its psychology, charged with the responsibility of seeing to it that the best powers of every man are discovered, developed, and put to their highest use?

A TRIAL OF MENTAL AND PEDAGOGICAL TESTS IN A CIVIL SERVICE EXAMINATION FOR POLICEMEN AND FIREMEN

By Lewis M. Terman, assisted in the tests by Arthur S. Otis, Virgil Dickson, O. S. Hubbard, J. K. Norton, Lowry Howard, J. K. Flanders and C. C. Cassingham

On October 31, 1916, the City of San Jose, California, made an unusual experiment, perhaps the first of its kind to be made in this or any country. The experiment in question involved a civil service examination for positions in the police and fire departments, based entirely on standardized mental and pedagogical tests. The experiment was proposed to the writer by San Jose's city manager, Dr. T. H. Reed, and his assistant, Mr. Paul Eliel.[1]

San Jose is a city of about 35,000 population. It employs a force of 48 firemen and 29 policemen, and the last budgets for these two departments were $73,583 and $40,500; a total of $114,083. Considering the size of the departments and the fact that tenure in both is permanent, it seemed highly desirable to find some means of selecting the best material available for the positions to be filled. The original suggestion merely had in view the use of some kind of mental test as supplementary to the usual form of civil service examination along scholastic lines. It was pointed out by us, however, that the proficiency of the candidates in the school subjects could also be much more accurately gauged by the use of standardized tests than by any improvised examination, a point which was quickly appreciated by the authorities responsible. Such an examination was accordingly arranged along the lines to be described presently.

The Intelligence Examination

We were asked whether it would not be feasible to give tests of reaction time, of speed of association, and of certain other special capacities which might be supposed to play a leading rôle in determining the efficiency of a fireman or policeman. It did not seem to us, however, that either our

[1] Dr. Reed was formerly professor of economics at the University of California, and Mr. Eliel is a graduate of Stanford University.

knowledge of the mental "faculties" needed by policemen and firemen, or our present means of testing such hypothetical faculties, would offer sufficient warrant for an experiment of this kind. On the other hand, we know that "general intelligence" can be measured with a fair degree of success, and we have reason to believe that this general intelligence, however we define it, is the most important single factor, apart from moral integrity, in determining fitness for positions of the kind in question. It was decided, accordingly, to limit this part of the examination to the use of the Stanford Revision of the Binet-Simon Intelligence Scale.

In order to save time, the Stanford-Binet scale was given in the abbreviated form, four tests being used out of each age group instead of the usual six (six instead of eight in year XII), and each weighted proportionately heavier. The scale thus abreviated has been found accurate enough for most practical purposes. Mr. Otis has shown that the probable error of the complete form of the Stanford revision, when used with miscellaneous adults testing from about twelve years up is a little over five months. When the scale is split into halves vertically, and only three tests used out of each group (four in year XII), the probable error of a mental age is about 10½ months. Accordingly we may assume that when four tests are used in each year, as in this experiment, the probable error of the resulting mental ages would be a little more than 8 months.

The Pedagogical Examination

The pedagogical tests given were of five classes: reading, writing, spelling, fundamental operations of arithmetic, and arithmetical reasoning.

The reading tests consisted of the Trabue Completion tests B and C and the Thorndike Oral Reading Test.[2] These were scored according to the methods set forth by the authors.

As a test of handwriting, the examinees were directed to write the sentence: "A quick brown fox jumps over the lazy dog", as well as possible at a moderate rate of speed, one minute being allowed. The samples were rated upon the Ayres Scale for Measuring the Quality of Handwriting of Adults.

The spelling test was one which had been devised by Mr. Otis for purposes of more rapid administration than the ordinary test. The even numbered words of Starch's first list of

[2] See Teachers College Record, Sept. 1914, pp. 67-69. As explained by Thorndike, this is chiefly a test of ability to pronounce words and not a complete test of reading ability.

100 words were chosen as a basis. An alternative spelling of each word was prepared in order that the examinee might merely indicate which was the correct spelling. The words were arranged in pairs as follows:

4. low	(	),	loe	(	).
12. fell	(	),	fel	(	).
26. bruch	(	),	brush	(	).
38. steal	(	),	steel	(	).
44. chaple	(	),	chapel	(	).
54. shroud	(	),	shrowd	(	).
62. leoperd	(	),	lepard	(	).
100. inefectuality	(	),	ineffectuality	(	).

In some cases both words were correct spellings, as No. 38; in other cases neither was correct, as No. 62. This was explained and the examinees were cautioned not to infer that if one spelling was correct the other would necessarily be incorrect, or vice versa.

The tests in fundamental operations of arithmetic were the tests in the adding, substracting, multiplying, and dividing series of single combinations found in Courtis' Standard Tests, earlier style. The times allowed for these tests were respectively 1 minute, 1 minute, 1½ minutes and 2 minutes. The number of correct combinations solved in a given time was the score in each test.

The test in arithmetical reasoning consisted of 25 problems, arranged in approximate order of difficulty, and was very similar to the Courtis reasoning tests. The solution was not required, but merely an indication of the operation involved, whether +, —, ×, or ÷. The proper sign was to be inserted, thus:

1. If a train goes 40 miles per hour for 5 hours, how many miles does it go? 40 5= ans.

16. If a rod of iron 10 feet long is reduced in length to 9.5 feet by twisting, how many feet long must a rod be before twisting to be 20 feet long after twisting? 10 9.5 = ans.

Conditions Under Which The Examinations Were Made

Thirty candidates presented themselves in competition for the ten or twelve prospective openings. Most of these were for positions in the fire department. The writer was present, with seven graduate students to act as assistants. Seven candidates were given the intelligence test simultaneously, each in a separate room of the city hall and with only the

examiner present.[3] The only exception to this was in the case of two examinations, to each of which two auditors were admitted. As soon as the first seven candidates had completed this individual examination, all were assembled in another room and given the pedagogical tests in a group. Then seven other candidates were taken through the same procedure, and so on until the thirty candidates had completed the examination.

The individual examinations, including the completion and reading tests, ordinarily consumed a little more than an hour, and the remaining pedagogical tests considerably less than an hour. The rooms in which the examinations were conducted were reasonably quiet and comfortable and the conditions in general were favorable. All of the assistants were students in a class studying intelligence tests, and all had taken extensive instruction in the Stanford-Binet procedure. The responses were taken down as nearly as possible verbatim, and to insure uniformity, the scoring was all checked up by the writer. It was found, however, that few errors had been made by the individual examiners in scoring. Credit for one test had been wrongly given or withheld in the case of nine subjects, and for two tests in the case of one subject. In the latter case the two errors offset each other and left a correct result.

With but one or two exceptions the candidates were entirely amenable and, to all outward appearance, interested. No really serious opposition was met, and only in one case was there any question of invalidation of the test result due to the attitude of the subject. Careful examination of all the records of this subject convinced us that his very low scores were due to stupidity rather than to his obstinate and critical attitude. Naturally, there were some expressions of surprise and also occasional questions regarding the relation between the work of a fireman or policeman and the abilities called for by the tests. Perhaps it would hardly be fair to expect our candidates to see any very intimate bearing of such tests as naming sixty words in three minutes, defining abstract words, reversing in imagination the hands of a clock, giving the moral of a fable, interpreting pictures, finding similarities, or filling a Trabue blank, on the handling of a fire cart or on the traditional duties of a policeman. Nevertheless, several of the candidates, for the most part those who ranked high in intelligence, volunteered their hearty approval of the novel kind of examination. A clerk in one of the city offices became so interested during the day that he asked permission

[3] The Trabue completion test and the Thorndike reading test were also given at this time.

to take the tests himself, just to see what he could do, a privilege which was gladly accorded him.

Personnel Of The Candidates

All of the candidates were American born. All but six were of Western European descent. The exceptions included four Spanish and two of Italian extraction. All spoke English without noticeable accent. Only two were of Irish descent!

The range in age was from 21 to 38 years, the median falling at about 30 years.

From questions regarding the extent of their schooling, it was found that only nine had completed the eighth grade, and that only four had attended a higher school. Five had not completed the sixth grade. Of the four who had attended high school, none had gone beyond the second year. Comparison of the highest grade reached with the age of leaving school revealed the fact that at least half of the candidates were two or more years below grade when they left school. Several had evidently belonged to that group of school children so well known to all teachers because of their all-round inability to make progress in their studies.

The incomes of the candidates during the past year ranged all the way from $420 to $1,350, the median being $960. The salaries of the positions competed for in the fire and police departments begin at $900 per year and increase by annual increments of $100 to a maximum of $1,200, with liberal retiring allowance at the age of 65.

Of the occupations which the candidates were following just previous to the examination, 7 may be classed as unskilled, 15 as semi-skilled or low-grade clerical, and 6 as skilled or high-grade clerical. The occupations of two candidates were not learned.

Results of the Intelligence Examination

The mental levels resulting from the Stanford-Binet test range from "superior adult" to below the borderline of mental deficiency. The actual distribution of "mental ages" was as follows:

M. age	10	10–6	11	11–6	12	12–6	13	13–6	14	14–6	15	15–6	16	16–6	17	17–6	18
No....	1	0	1	1	2	5	4	3	2	6	1	1	1	0	0	1	1

The above table shows the mental ages grouped in ranges of six months, the 12-6 group including the mental ages from 12-4 to 12-9, inclusive, and similarly for the other groups.

Converting the mental ages into intelligence quotients, disregarding actual age above sixteen years, we have the following distribution:

IQ	60–64	65–69	70–74	75–79	80–84	85–89	90–94	95–99	100–104	105–109	110–114
Number	1	1	2	6	7	4	4	2	1	1	1

The median mental age was 13-5, or IQ 84. The lowest quartile (in this case the lowest seven) fell below IQ 78; the highest quartile (highest seven), above IQ 91.

In the light of Stanford University tests of various social groups the significance of the above results may be indicated as follows: the lowest individual, and probably also the next lowest, may be termed intellectually feeble; the next two (70-74 group) are near the borderline of intellectual feebleness; the next six (75-79 group) are very inferior; the eleven in the two groups 80-84 and 85-89 belong to the "inferior adult" level; the eight between 90 and 109 are "average adults"; and the one reaching 112 belongs distinctly to the level we have designated as "superior adult."

These mental ages and IQ's will doubtless seem very low to those who have been accustomed to draw the line between normality and mental deficiency in adults at the 12-year mental level, or 75 IQ. In reality, of course, there is no clear line of demarcation between normality and feeble-mindedness. The distinction is arbitrary, and whatever standard is taken there will always be more borderline cases than high-grade defectives. Tests of various industrial groups have convinced us that the usually accepted twelve year standard is so high as to include in the "defective" class a fairly large proportion of reasonably efficient unskilled laborers. In all probability not far from five per cent of unselected adults in the average community have an intelligence level not superior to that of the average child of twelve years. It seems that twelve-year intelligence, if backed by physical strength and law-abiding habits, is ample for pick-and-shovel purposes, and probably for many other kinds of unskilled labor. Those who fall as low as 10 years, however, are rarely "able to manage themselves or their affairs with ordinary prudence."

Adults who test in the neighborhood of eleven years may or may not be in danger of becoming social incompetents. Much depends upon their training, their emotional traits, their physical strength, the amount of assistance rendered them by solicitous relatives and friends, the conditions of the labor market, etc. It would be a serious mistake to suppose that intelligence is the only criterion of social and industrial competency.

As we have pointed out elsewhere,[4] the term feeble-mindedness is currently used in two different senses, one referring to the intellectual status of an individual, the other to his inability to get on in the world. It is the failure to make this distinction which has provoked so much discussion, sometimes of acrimonious nature, as to who is feeble-minded. In the hope that it would contribute to a better mutual understanding among the workers, we have suggested that we substitute for the ambiguous term "feeble-minded" the two terms "intellectually feeble" and "socially feeble." The diagnosis of intellectual feebleness is absolute, as intelligence is a definitely measurable thing. The diagnosis of social feebleness will always be relative and less exact, for the reason that one's ability to escape social incompetency is affected by so many extraneous and unpredictable factors of environment and by so many other mental and also physical traits. We have recommended that the term "intellectually feeble" be applied to those who test below 70 IQ by the Stanford-Binet scale. For adults this would include in the group of intellectually feeble those testing as low as 11 years. Our data lead us to believe that the large majority testing below this point are also likely to fall into the class of socially feeble, on any reasonable interpretation of the term. Those testing between 70 and 75 may or may not be socially feeble, but the range of the latter class doubtless extends in some cases as high as 80 IQ or even higher.

In testing school children we have found that those who fall below 75 IQ are rarely able to do the work above the seventh grade with average marks, however long they remain in school, although such children are sometimes promoted to the eighth grade or even to the high school "because of age and maturity." Those below 70 IQ rarely do much of the work beyond the sixth grade satisfactorily. A child of IQ as low as 85 is rarely able to make much headway in the average California high school, while few are able to graduate from

[4] "The Binet Scale and the Diagnosis of Feeble-Mindedness," *Journal of Criminal Law and Criminology*, November, 1916.

a high school who fall as low as 90. It should be stated, however, that the limits of IQ within which various degrees of school success are attainable have not yet been ascertained with accuracy. Several Stanford University students are at work on this problem.

The minimum IQ compatible with efficiency in the case of policemen or firemen is not yet known, easy as it would be to ascertain it. In the absence of a more definitely established standard we recommended that in this case all candidates be rejected who graded lower than 80 IQ. This recommendation was accepted by the city manager, with the result that ten of the thirty candidates were thus eliminated. The remaining twenty candidates were given a final rank order by combining the rank order resulting from the intelligence test with that resulting from the pedagogical tests taken together, giving double weight to the intelligence test. This procedure is arbitrary, but it is probably as defensible as any of the other methods which suggested themselves.

Our own examination was only one of four criteria employed by the city manager in determining the fitness of the candidates. The other three included a thorough medical examination of each candidate, a series of physical tests (such as strength, running and rope climbing), and personal and moral qualities as indicated by previous record, testimony of disinterested persons, etc. We are not here concerned with these aspects of the total examination, further than to state that all testing above 80 IQ were placed on the eligible list except two who were rejected on the physical tests, and that all who tested below 80 were rejected without further consideration. The latter group included four individuals who, at the time of the examination, were already serving in the fire department as "extras", having gotten their positions under the political system of city government which existed before the city manager came into office. The IQ's of these four men were 63, 74, 77, and 79.

Correlations of the Mental and Pedagogical Tests

In intercorrelations for mental age, vocabulary (a part of the Stanford-Binet test), monthly salary at the time of the examination, and the scores earned in the several pedagogical tests were ascertained by the Spearman footrule, and the R's were then converted into r values by a conversion table. The results are set forth in the following table:

	Mental age	Vocabulary	Trabue completion	Arith. reasoning	Reading	Spelling	Arith. fundamentals	Handwriting	Salary
Mental age.....		.68	.67	.81	.48	.32	.55	.43	.61
Vocabulary.....	.68		.60	.72	.51	.41	.59	.44	.35
Trabue completion. ...	.67	.60		.65	.26	.30	.57	.17	.60
Arith. reasoning.....	.81	.72	.65		.41	.31	.71	.34	.52
Reading.....	.48	.51	.26	.41		.60	.31	.48	.45
Spelling.....	.32	.41	.30	.31	.60		.40	.20	.43
Arith., fundamentals..	.55	.59	.57	.71	.31	.40		.50	.30
Handwriting.....	.43	.44	.17	.34	.48	.20	.50		.26
Salary.....	.61	.35	.60	.52	.45	.43	.30	.26	

It will be observed that all of the correlations are positive and that most of them are fairly high. The probable error is .078. In the main, however, mental age, vocabulary, completion and arithmetical reasoning give higher correlations with one another than reading, writing, spelling, and fundamentals give with one another or with the several tests of the first group. The first four are preëminently tests of general intelligence, the last four depend more upon special factors. Salary gives higher correlations with the first group than with the last; that is, it depends more upon general intelligence than upon such special factors as are involved in reading, writing, fundamentals and spelling.

If we consider mental age, vocabulary, arithmetical reasoning, and ability in the completion test as dependent mainly upon general intelligence, as would be suggested by the table of correlations, it is interesting to find the average correlation of each item with this group. Doing this we have the following:

	Average correlation with mental age, vocabulary, arithmetical reasoning, and Trabue	
Spelling	.335	
Handwriting	.345	
Reading	.415	
Salary	.52	
Fundamentals	.605	
Completion	.64	(with other three)
Vocabulary	.666	(with other three)
Mental age	.72	(with other three)
Arith. reasoning	.728	

The average correlation of reading, handwriting, spelling, and fundamentals with each other is .405. It is evident, therefore, that the special factors operating in these tests are about as much independent of one another as they are independent of general intelligence. On the other hand, the average correlation of mental age, vocabulary, completion ability, and arithmetical reasoning with each other was .688, showing that these tests draw heavily upon a common factor.

The abbreviated Stanford-Binet scale was split vertically in halves in order to find the correlation of each half with the other. When treated in this way each half of the abbreviated scale becomes a doubly abbreviated scale, having only two tests in each group, except year XII, in which there are three. The mental ages were then computed on each of these doubly abbreviated scales by giving each test double weight. The resulting mental ages gave a correlation of .69 between the two halves. This is large enough to indicate a fairly high reliability for the form of the scale used.

In similar manner the subjects were ranked separately in the Trabue completion tests B and C, the resulting correlation being .71. This high correlation is what should be expected, considering the almost identical nature of the two completion tests.

Especially noteworthy is the high correlation of salary with intelligence as indicated by such tests as mental age, vocabulary, Trabue, and arithmetical reasoning. As an indication of general intelligence salary is far more significant than proficiency in one of the school subjects.

The correlation of salary with age was positive but surprisingly low, namely .21. We may conclude, therefore, that the earning capacity of individuals like those which compose our group is determined far more by general intelligence than by length of service.

The enormous superiority of skilled over unskilled workers in general intelligence is shown in the following table:

Occupational group	Unskilled	Semi-skilled	Skilled
Range of IQ	63 to 89	74 to 96	84 to 112
Average IQ	75.5	85.2	98.3

When similar data are available for large numbers in all the main occupational groups, intelligence scales will play an important rôle in vocational guidance.

Between age and mental age there was no significant correlation (— .05). The correlation of age with completion ability and arithmetical reasoning was —.07 and .03, respectively. Insofar as our subjects are representative of their several ages it appears that the tests we have used are absolutely uninfluenced by age differences between 21 and 38 years—that they are little affected by the incidental experiences of adult life.

The correlation between mental age and amount of schooling could not be ascertained accurately for the reason that 21 of the 30 candidates had left school either in the seventh or eighth grade. It was also impossible to learn in all cases the exact number of years a candidate had spent in school. It is significant, however, that the three subjects who failed to reach the sixth grade tested at 74, 77, and 78 IQ, and that the two who reached the second year of high school tested 108 and 112. The average IQ of those who left school at the seventh grade was 81.3; of those who left at the eighth grade, 84. This is in harmony with numerous investigations which have shown that inferior ability is one of the important factors operating in favor of elimination from school. Such facts would warrant excluding from examination for positions of this kind all applicants who have not completed a certain minimum of school work, say that represented by graduation from the eighth grade, or preferably the high school.

Those who assisted in the tests were asked to compare the results of each test with the expectations aroused by the general personal appearance of the subject. No effort was made to get a quantitative expression of the agreement or disagreement, but every assistant met with one or more cases in which the test result was decidedly higher or lower than the appearance of the subject had suggested. It seems highly desirable that some means be employed to serve as a check upon the

influence of "good looks" in the sifting of candidates for a position.

Miscellaneous Observations

It would be highly instructive to compare men and women workers as regards the salary outlook for various grades of intelligence. The median IQ of the eighteen candidates who were placed in the eligible list was 89. Seven of these tested between 80 and 85. However long they remain in school, individuals of the 80 grade have the greatest difficulty in completing satisfactorily the work of the eighth grade; those of the 90 grade, the high school course. Yet the salary which these men will be paid as policemen and firemen exceeds by far that of the average California teacher, who according to an investigation now in progress, rarely tests as low as 100 IQ and usually above 110. It is unnecessary to dwell upon the economic injustice revealed by such findings.

The following data regarding individual applicants may be of interest:

No. 30,[5] whose IQ was 63, is employed in his father's store at a salary of $25 per month. Since this man is 34 years of age and lives in a community where the common unskilled laborer readily earns from $50 to $60 per month, it appears that he belongs in the socially feeble as well as in the intellectually feeble group. Notwithstanding this fact, he had previously secured a position as an "extra" in the fire department. His father is said to be a man of some local prominence.

Information regarding No. 29 (IQ 67) was obtained from a responsible clerk in one of the city offices. Our informant, who had commanded a militia company in which No. 29 was a private, states that he had long considered him to be definitely feeble-minded. The best job this applicant had held was as stationary fireman in a hotel. He had lost this and at the time of the examination was without regular employment. Again the intellectual feebleness indicated by the intelligence test is supported by the suggestion of social feebleness.

Our above mentioned informant had also had No. 28 (IQ 71) in his militia company, and states that, although the latter is extremely stupid, he is not considered feeble-minded. He has worked as a hotel porter at $40 per month, and as railroad signalman at $65 per month. It is true that the duties of railroad signalmen are extremely simple, but it is also true that the careful and attentive performance of these duties is

[5] The numbers here used refer to rank order in intelligence.

a matter of great importance. Whether it is safe to entrust such a task to a person of 71 IQ is doubtful, to say the least.

No. 27, aged 34, IQ 74, claims to have earned $80 per month as a stage carpenter. He had also served as an "extra" in the fire department. No other information was available.

No. 26, aged 30, IQ 77, was a laborer in a saw mill at $40 per month. He had also served a term in the regular army, rising to the rank of sergeant. After failing in this examination he returned to the army.

No. 24, IQ 77, had worked as a paper hanger at $18 per week, and had served as an "extra" in the fire department.

No. 23 was a teamster, No. 22 was a deliveryman for a grocery store and had served as an "extra" in the fire department, and No. 21 had no occupation other than as an "extra" on the fire force. These tested at 78, 78, and 79, respectively.

No. 20, aged 34, IQ 81, had served several years as a policeman in an eastern state at $65 to $80 per month.

Our informant stated that he expected No. 16 (IQ 83), to test much higher than he did. This individual is a street car conductor and is said to be very popular with his patrons because of his genial good nature, his interest in people and his memory for names. He is an Irishman and his racial social traits have doubtless led his friends to overestimate his grade of intelligence.

No. 1, aged 31, IQ 112, had completed the second year of high school, had taken an extensive correspondence course in the International Correspondence School along commercial lines, and had earned as high as $125 per month as a salesman. His purpose in seeking a position in the fire department was to secure leisure for carrying on another correspondence course in expert accounting. His mother had been a teacher.

The clerk in the city hall who was given the tests as requested, earned an IQ of 113 and ranked first in both the mental and pedagogical tests. He was graduated from high school and attended a university for one year. He is said to be very efficient.

In conclusion, while emphasizing the tentative nature of our experiment we would point out the need of further work in this direction, and especially the desirability of correlating the results of mental tests with the later success of the accepted candidates. Our data lead us to believe that intelligence tests are likely to be found a valuable aid in the selection of applicants for certain types of positions. In order to utilize fully the advantages of the test method for this purpose, however, it will be necessary to secure comparative norms of performance for various occupational groups.

THE LEGIBILITY OF A TELEPHONE DIRECTORY

By Professor JOHN WALLACE BAIRD, Clark University

I. Introduction

The New York Telephone Company recently found itself confronted by a serious practical problem. Their telephone directory contained nearly one thousand pages; these pages were approximately nine by twelve inches, and the volume was nearly an inch and a half thick. Since many names of new subscribers were being added with every new issue of the directory, it seemed inevitable that future issues of the volume would become too unwieldy and cumbersome to handle effectively. Ineffective handling of the directory on the part of the user of the telephone must result in misreadings and errors; and since the New York Telephone Company handles millions of calls every day, it is a matter of paramount importance that the directory should be printed in such form as to insure the greatest possible accuracy of reading.

All of these circumstances raised the interesting practical problem in the minds of the Engineering Department of the Telephone Company: Is it not possible to condense the size of the telephone directory, and thus make future issues of it less difficult to handle and less subject to misreading? And if so, what is the best plan to follow in improving the form of the directory? Accordingly, Mr. W. A. Bentley of the Engineering Department of the New York Telephone Company, consulted with the writer; and an experimental investigation of the problem was undertaken. The writer is indebted to Mr. Bentley for valuable coöperation and helpful suggestions throughout the investigation; and to Messrs. L. W. Robinson, B. K. Rhoades and P. K. Houston, employees of the New York Telephone Company, for their diligent and painstaking work in obtaining the data upon which this study is based.

II. Experimental Investigation

A. Materials and Method of Procedure

A general survey of the situation indicated that the most hopeful method of bringing about the desired result would consist in printing four columns of subscribers' names to the

page, instead of the existing three-column arrangement. This plan would of course result in a considerable reduction in the number of pages in the directory; but it seemed probable that an increase in the number of columns upon the page would make it more difficult to find the telephone number of any given subscriber,—that is, that an increase in the content of the page would decrease the legibility and would result in an increase of time required for consulting the directory.

In order to counteract this probable tendency toward increased illegibility two expedients were devised:

a. Indentation. When a reader consults a printed list, such as the names in a telephone directory, his misreadings are frequently due to the fact that his glance fails to follow the printed line accurately; in hastily glancing across the column, from the subscriber's name at the left to his telephone number at the right, the reader's regard frequently wanders either upward or downward to an adjacent line, instead of following a horizontal direction. In consequence of this he reads the telephone number which appears in the adjacent line, immediately above or immediately below the number sought. Such misreadings or errors of reference are especially frequent in cases where the printed letters do not completely fill the line,—that is, where a blank space intervenes at the center of the column, and where, therefore, no horizontal line is present to serve as a guide to the eye-movement of the reader. Now it seemed probable that this particular type of misreading could best be obviated by printing the parallel columns of names and numbers in alternately indented arrangement, —that is, by indenting every alternate line of the list of names and numbers, and thus printing it a short distance to the right or left of the preceding and succeeding lines. This form of printed page we shall call Page-Arrangement C (see illustration, p. 32).

b. Leading. Previous investigations of legibility[1] have shown that the blank space which appears between adjacent lines of a printed page is a potent factor in determining the legibility of the page. Within certain limits degree of legibility varies directly with the width of this blank space (or thickness of leading). Unfortunately, in the present instance it was not feasible to insert any considerable thickness of leading between adjacent lines for the reason that the insertion of one-eighteenth of an inch would result in a loss of all of

[1] Notably B. E. Roethlein, The Relative Legibility of Different Faces of Printing Types. *Amer. Jour. Psychol.*, XXIII, 1912, pp. 1-36.

Skidmore C W, Res.....63 Bay 20th.Bath Bch 878-J
Skidmore Jas R, Res.....60 Ray.Jamaica 483-W
Skidmore Dr Joel L,Dentist.707Church.Rich Hill 498
Skidmore Jos N, Musicn.562 Central av.Bushwick 4514
Skidmore L R, Res.....73 Clifton pl.Prospect 3779-W
Skidmore Lewis P, Res.381 Vndrbilt av.Prospect 6581-W
Skidmore M G, Res.....73 Clifton pl.Prospect 3779-W
Skidmore Thos, Res.....644 E 4th.Flatbush 8558
Skidmore Wm S, Res..258 Arlington av.Cypress 1928-J
Skillman Anna L, Res..181 Berkeley pl.Prospect 3825-W

Sleaster Fredk, Res.....2047 E 15th.Coney Isl 1795
Slee A M, Grad Nurse..102 Pierrepont.Main 4333
Slee Arthur W, MD, Res..97 Halsey.Bedford 7496
Slee Mrs E G, Res.....465 Kosciusko.Bushwick 409-R
Slee John B, Architect...154 Montague.Main 4224
Slee & Bryson, Archts...154 Montague.Main 4224
Sleeper Chas E, Res..875 Sterling pl.Bedford 7818-R
Sleeper T E, Res.....1435 53d.BoroPark 1083-W
Sleeper Wm H, Plumbg, Heat.439Hart.Bushwick 1939-M
Residence.....945 Greene av.Bushwick 1404-J

Slutzky Max, Grocer.....1746 Bath av.Bath Bch 317
Slutzky Wm, Dental Lbtry...284 S 9th.Wmsburg 4754
Sluus J H, Res.....196 Barclay.Flushing 1330
Smack Mrs A, Res.....552 E 5th.Flatbush 3967
Smack Alfred D, Res.....586 Quincy.Bushwick 3465-J
Smale M H,LithoTrnsfr Papr.27McDugl.East N Y 1414
Small Bert J, Barber.....68 7th av.Prospect 5583
Small C L, Res.....Murray.Flushing 57
Small Chas, Res....1031 Prospect pl.Bedford 2463-R
Small Chas E, Res.....432 74th.BayRidge 2629

A. Three-Column Page, Ordinary

Skarren Miss A R, r, 38 Murray.....Flushing 2291 R
Skea Alfred, Agent, 420 Greenwd av.South 4381
Skeffington John J, r, 10 Parkside ct.Flatbush 9648
Skehan Chas, r, 177 Jackson.....Greenpnt 1667
Skehan Homer I, Rl Est, 189 Mntgue Main 7882
Skellenger Rev D W, r, Prospect av..RichHill 1101
Skellett Mrs Mary, r, College Pt,LI.Flushing 1273W
Skelley Mrs W J, r, 1389 Pacific....Bedford 5373
Skellinger H L, r, 562 Bainbridge..Bushwick 5031W
Skelly Mrs E C, r, 397 1.....South 4262W

Slattery Miss Mary K, r, 705 Prsdnt av Prospect 1318 J
Slattery P J, r, 115 Crystal.....Cypress 1739W
Slattery Peter A, r, 257 Rugby rd...Flatbush 6096W
Slattery Thos F, r, 322 60.....Sunset 1043
Slattery Wm F, r, East Elmhurst, LI.Newtown 1143
Slaughter Miss M F, r, 3001 Fulton.Cypress 4198
Slaughter Wm H, MD, r, 1406 Av H.Flatbush 2898
Slauson K W, r, 117 Montague.....Main 3665
Slaven Mrs E, r, 1360 Park pl.....Bedford 7770M
Slavin Electric Co, Seaside Walk...Coneylsl 2367

Slowig Wm, Hotel, Woodside, LI...Newtown 269
Sluiter A C, Butcher, 64 Main.....Flushing 207
Sluiter A C, r, 188 Madison av.....Flushing 2436
Sluiter N F, r, 649 10.....South 4395
Sluter H, r, 980 Lincoln pl.....Bedford 5816W
Sluth Martin, r, 577 E 8.....Flatbush 5645
Slutsky Bros, Prod, 28 Seigel.....Wmsburg 3022
Slutsky Nathan I, MD, r, 344 Jay...Main 1940
Slutzke Edward, r, 1025 E 14.....Midwood 7031
Slutzker Barnett, Staty, Cgrs

Smith Dr Alfred E, Dentist, 415 Flth Main 1081W
Smith Alfred H, MD, r, Springfld, LI Springfld 1881
Smith Allan C, r, 94 2d pl.....Hamilton 1145 J
Smith Alphonzo, Pianos, 25Flthsh av Main 896
Smith Alva C, r, 1085 Eastrn pkway.Bedford 4255
Smith Amelia, r, Highland av.....Bayside 2983 R
Smith Amos A, r, 61 Pierrepont.....Main 7733
Smith Mrs Andrew A, r, 436 Clasn av Prospect 2048
Smith Anna A, r, Van Sicklen.....Coneylsl 2241W
Smith Miss Anna E, r, 413 DeKalb av Prospect 7606 J

B. Four-Column Page, Ordinary

Sipp Christian, r, 1214 Bushwick av.Bushwick 5320
Sipp Mrs Geo A, r, 711 Beverly rd...Flatbush 9960
Sipp John L, r, 395 Henry.....Hamilton 2446
Sippel A, Meat Mkt, 77 17 3d av....BayRidge 1335
Sippell & Co, Shoes, 797 Fulton....Prospect 1757 J
Sipperley L H, r, Woodside, LI.....Newtown 1482M
Sipperly Wm H, r, Woodhaven, LI..RichHill 3667 J
Siqueland Theo, DDS, Off, 67 Hnsn pl Prospect 4300
Residence, 953 President....Prospect 2734 J
Sir Henry The, E 16.....Flatbush 2100

Skivesen Miss Anna, r, 154 Prspct av.South 1062 J
Sklar J Mfg Co, Surgl Insts, 133 Flyd Wmsburg 2329
Sklar J, r, 661 Willoughby av.....Wmsburg 5558 J
Sklar Jos, Cabinet Mkr, 672 Hpkinsn av East N Y 3484
Sklarek Albert, Furniture, 39.....Sunset 3710
Sklarz Martin, r, 327 Spruce.....RichHill 1255W
Skloot P & Co, Poultry, 228 N 9....Greenpnt 471
Skoblow H, Grocer, 201 Sumner av..Bushwick 3371
Skog Carl G, r, 1498 Pacific.....Bedford 8310M
Skoglund J V, r, 1341 Bedford av...Bedford 1529W

Sloan Engineering Co, 246 Hall...Prospect 4764
Garage Dept, 236 Lafayette av.Prospect 4764
Sloan Francis H, r, 267 Hancock...Bedford 526
Sloan Frank T, r, 234 E 3.....Flatbush 1443M
Sloan Henry L, 351 Jay.....Main 8185
Sloan Herman J, Meats, 165 Franklin Greenpnt 3059
Sloan Jas, Hay, Feed, 1063 Atlntc av Prospect 79
Sloan Miss Mary E, r, 562 3.....South 2552 J
Sloan Robert S, r, Woodmere, LI...Woodmere 3290
Sloan William C, Elec Contr

Smallwood Thos Jr, r, 657 Park pl..Prospect 6836 J
Smart F R, r, 132 Jamaica av.....Flushing 633
Smart H C, r, 398 Lafayette av.....Prospect 6994
Smart I H, r, 193 Ksap.....Wmsburg 4573
Smart Shop, MensFurn, 140 Flthsh av Prospect 6732
Smart T E, Hotel, College Pt, LI...Flushing 1950
Smart W J, r, 21 Decatur.....Bedford 3475 R
Smart Wm C, r, 1st.....Bayside 2873W
Smart Wm E Jr, r, Woodhaven, LI...RichHill 2935
Smedley J H, r, Central av.....Woodmere 3643W

C. Four-Column Page, Indented

Skeves S H, r, 896 Brooklyn av.....Flatbush 8699 J
Skibo Kennels, 341 Morgan av.....Stagg 4195
Skidmore Abram W, r, 44 Crescent...Far Rock 86
Skidmore C J, r, 95 82.....BayRidge 741M
Skidmore Mrs E, r, 22 McDonough..Bedford 4393 R
Skidmore G W, r, 63 Bay 20.....BathBch 878 J
Skidmore Jas R, r, 60 Ray.....Jamaica 483W
Skidmore Dr Joel L, Dntst, 707 Chrch RichHill 498
Skidmore Jos N, Musicn, 562 Centrl av Bushwick 4514

Slavin P, r, 784 Putnam av.....Bushwick 1871M
Slavin Miss R, Trnd Nrse, 375 Kosciusko Bushwick 5419
Slavin Samuel A, 62 Floyd.....Wmsburg 894
Slavit Jos, MD, r, 366 14.....South 1805
Slawson Miss C W, r, 345 Estrn pkwy Prospect 6050W
Sleaster Fredk, r, 2047 E 15.....Coneylsl 1795
Slee A M, Grad Nurse, 102 Pierrepnt Main 4333
Slee Arthur W, MD, r, 97 Halsey...Bedford 7496
Slee Mrs E G, r, 465 Kosciusko.....Bushwick 409 R

Sluter H, r, 980 Lincoln pl.....Bedford 5816W
Sluth Martin, r, 577 E 8.....Flatbush 5645
Slutsky Bros, Prod, 28 Seigel.....Wmsburg 3022
Slutsky Nathan I, MD, r, 344 Jay...Main 1940
Slutzke Edward, r, 1025 E 14.....Midwood 7031
Slutzker Barnett, Staty, Cgrs
407 6th av South 1233
Slutzky I, Cgrs, 531 Flushing av....Stagg 2530
Slutzky Louis, r, 627 Marcy av.....Wmsburg 3619 J

Smith Agnes M, r, 180 30.....South 3756W
Smith Albert A, Electrician, 1426 58 BoroPark 3193W
Smith Albert A, r, 481 sl.....South 322
Smith Albert E, r, 118 St Marks av.Prospect 6880
Smith Albert J, r, 973 E 10.....Midwood 4481 J
Smith Albert P, r, 881 New York av.Flatbush 1321W
Smith Dr Alfred E, Dentist, 415 Flth Main 1081W
Smith Alfred H, MD, r, Springfld, LI Springfld 1851
Smith Allan C, r, 94 2d pl.....Hamilton 1145 J

D. Four-Column Page, Leaded

the space which had been gained by adopting the four-column arrangement of page. Hence it was decided to determine whether the inserting of a modicum of leading (one-seventy-second of an inch) would not have the desired effect.

We selected four arrangements of page, and had these four prepared by the printer; and the investigation then set out to discover which page-arrangement possesses the greatest advantages. These four arrangements of page were as follows: 1. A four-column page, set by the printer in exactly the same form as the existing page of the directory with the sole difference that under the new arrangement the page contained four columns instead of three.[2] This arrangement of page is referred to hereafter as the B Arrangement, or the Four-Column Page *Ordinary* (see illustration). 2. A page was arranged exactly like the foregoing, excepting that every alternate line was indented,—hereafter referred to as the C-Arrangement, or the Four-Column Page *Indented*. 3. The next arrangement differed from the ordinary four-column page only in that instead of being set 'solid' the lines were separated from one another by half a point of leading,—hereafter referred to as the D-Arrangement, or the Four-Column Page *Leaded*. 4. In order to have a standard of comparison we also employed pages from the existing directory; this arrangement we shall refer to as the A-Arrangement, or the Three-Column Page *Ordinary*.

The investigation consisted essentially in determining how much time is required to find the telephone number of a given subscriber selected from each of these four arrangements of page. The detailed procedure in conducting the investigation was as follows: Each of the twelve pages to be tested (an I-page, an M-page and an S-page, printed in each of the four page-arrangements) was mounted upon a sheet of cardboard and bound in the form of a booklet. An appropriate room was set apart for the experiments; and a carefully-planned schedule of experimental sittings was arranged before the experiments began. When any reagent[3] entered the room he was placed in a comfortable seat, which occupied a constant position. After a 'ready' signal, the name of a subscriber was either read aloud to him by the experimenter or was shown to him upon a printed card. The reagent

[2] The form of letter used in printing page-arrangements B, C and D was slightly different from that which had been used in former issues of the directory (page-arrangement A),—the innovation consisting essentially in a slight condensation of the width of the letters.

[3] The individuals who served as subjects in these experiments will be referred to as reagents.

first repeated this name aloud in order to make sure that he had perceived it correctly; then he opened the booklet which lay before him on the table and proceeded to find the telephone exchange and the number listed opposite the given name. The experimenter, by means of a stop-watch, determined the amount of time required for finding the exchange and number,—measuring the time which elapsed from the instant when the reagent opened the booklet until he pronounced the name of the exchange and the telephone number. This procedure was carried through without change for all reagents.

In order to eliminate the influence of accidental conditions, and to make our results not only more accurate and reliable but also more subject to general interpretation, the following precautions were observed: Thirty-two reagents were employed, and care was taken that these individuals should represent various degrees of intelligence and various degrees of practice and skill in the use of the directory. These thirty-two individuals were all chosen from among the employees of the Telephone Company; eight were selected from the installation force (Plant Department), eight from the solicitors and other outside workers of the Commercial Department (Commercial Outside Department), eight from the office force of the Commercial Department (Commercial Inside Department), and eight from the Directory Department. Individuals were selected who possessed various degrees of visual acuity and refractive defect; and in order that the conditions of our experiment might further approximate the actual conditions under which the directory is ordinarily consulted, various degrees of natural and artificial illumination were included in the experiments. In order further to eliminate accidental circumstances, both easy and difficult pages were included in the test; pages whose names began with the initials I, M and S were found to vary sufficiently in difficulty to fulfil the necessary conditions here The names were presented to the reagent alternately in oral and in visual (typewritten) fashion. Each of the thirty-two reagents was given thirty tests with each of the four arrangements of page, making a total of more than thirty-eight hundred individual tests. The experiments were arranged in such fashion as to eliminate or at least to neutralize the effects of practice, the testing of the various page-arrangements being so distributed that no page-arrangement would profit more than any other from the practice which the reagent had acquired in the course of the experiments. Care was taken to provide that the experimental sittings should be so short as not to give rise to fatigue.

B. Results

The numerical results of these experiments are presented in Table I. The numbers tabulated represent the average times required for finding the telephone number of a given subscriber (finding-time) by each of the four groups of individuals, with each of the four arrangements of page,—all of these finding-times being recorded in seconds. The numbers in the lowest line of the table represent the average finding-time for all reagents of the four groups,—that is, for the thirty-two reagents.

TABLE I

The numerical data tabulated here represent the average finding-time of each group of reagents, for each of the four arrangements of page,—that is, the average time required for finding the telephone number of a given subscriber with each of these four variations of printed page,—together with the general average, or average finding-time of all thirty-two reagents. Each average in the first four lines of the table is computed from two hundred and forty individual tests; and each general average, set down at the foot of each column, is an average of nine hundred and sixty individual tests.

Reagents		A Three-column page,—ordinary	B Four-column page,—ordinary	C Four-column page,—indented	D Four-column page,—leaded
Employees of "Plant" Dep't.....	Average finding-time.	13.96 sec.	16.98 sec.	15.22 sec.	14.63 sec.
	Mean variation.....	5.36 sec.	7.23 sec.	6.34 sec.	5.91 sec.
Employees of "Commercial Outside" Dep't...	Average finding-time.	10.21 sec.	9.82 sec.	9.69 sec.	8.20 sec.
	Mean variation.....	4.42 sec.	3.89 sec.	3.15 sec.	2.67 sec.
Employees of "Commercial Inside" Dep't. ...	Average finding-time.	10.26 sec.	9.81 sec.	9.56 sec.	8.56 sec.
	Mean variation.....	2.80 sec.	2.75 sec.	3.96 sec.	2.54 sec.
Employees of "Directory" Dep't.....	Average finding-time.	7.00 sec.	6.16 sec.	6.04 sec.	5.65 sec.
	Mean variation.....	2.22 sec.	1.93 sec.	1.69 sec.	1.30 sec.
	General average.....	**10.36** sec. ± 3.69 sec.	**10.69** sec. ± 3.95 sec.	**10.14** sec. ± 3.79 sec.	**9.28** sec. ± 3.20 sec.

A survey of this table shows that the average time required for finding a telephone number in the old directory (three-column page) is 10.36 seconds. When the names of the subscribers are printed in a four-column arrangement, without indentation and without leading, the finding-time is slightly increased,—being raised to 10.69 seconds. When the four-column page is printed in indented arrangement the finding-time is reduced to 10.14 seconds. And when the four-column page is very slightly leaded the finding-time is reduced to 9.28 seconds. This means that the ordinary four-column page and the ordinary three-column page are about equally legible; that the use of the indented form of column increases the legibility by about five per cent.; and that the insertion of half a point of leading increases the legibility by about thirteen per cent.

The statements in the foregoing paragraph are based upon results obtained from all four groups of reagents. The members of these four groups represented widely different stations in life, and widely different degrees of practice and skill in consulting such a work of reference as the telephone directory.[4] If now we ignore the results obtained from the installation force,—who were manual laborers and infrequent users of the telephone,—and average the results of the three other groups, we find that the leaded four-column page excels the old three-column page by approximately eighteen per cent. The members of these three groups represent the most frequent and perhaps the average and typical users of the telephone; and hence it seems probable that eighteen per cent. is a more accurate measure of the superior excellence of the four-column leaded arrangement than the percentage quoted in the foregoing paragraph, since the employees of the Plant Department probably represent a class of society which makes but infrequent use of the telephone directory.

And since the employees of the Directory Department possess a degree of skill and dexterity in the use of the directory which is seldom approximated by the average subscriber, it would be interesting to ignore their results and to consider only the results obtained from the employees of the Commercial Department. The sixteen members of this latter group probably represent the average users of the telephone more adequately than the members of the other two groups. The finding-times of these sixteen individuals show an average of 10.24 seconds for the three-column page, and 8.38 seconds for the four-column leaded page,—a superiority of slightly more than eighteen per cent. These considerations indicate that the four-column leaded page is equally advantageous for the ordinary individual and for the highly expert individual. In any case, it is obvious that the four-column leaded page is much more legible than the page of the old directory, and considerably more legible than either of the other two page-arrangements tested.

In consequence of this investigation the New York Telephone Company selected the D-Arrangement of page, and in the next issue of their directory the names of their subscribers

[4] The group from the Plant Department represented skilled manual labor rather than the ordinary type of manual labor. The group from the Commercial Outside Department represented the average type of outdoor salesman. The group from the Commercial Inside Department represented a combination of high-class clerical labor and inside salesmanship. The group from the Directory Department represented the maximum degree of practice and skill in using the directory.

were printed four columns to the page, the lines of print being separated from one another by half a point of leading. The new directory is not only more legible than the old by more than ten per cent. but it also reduces the bulk by approximately twenty per cent. (a decrease of about two hundred pages).

Two other features of our results may be mentioned here. The indented form of page proves to be but little superior to the ordinary form of page; indenting turns out to be much less efficacious than leading. If we may assume that alternate indentation really facilitates the reader's endeavor to follow the horizontal line of print, our data would seem to indicate that misreadings which are due to the crowded condition of the printed page are of much greater significance than misreadings which are due to one's tendency to wander away from the horizontal line of print.

Our data furnish a measure of the effects of practice in using the telephone directory. The average finding-time of the most practiced group of reagents,—the employees of the Directory Department,—is only about two-fifths as long as the average finding-time of the least practiced group,—the employees of the Plant Department,—the average finding-time being 6.46 seconds for the former group and 15.20 seconds for the latter group.

MENTALITY TESTING OF COLLEGE STUDENTS[1]

By W. V. Bingham
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I. The Demand for Student Testing.
  a. Six-fold source of the present practical demand.
    1. Selection of students for admission.
    2. Classification of students according to ability.
    3. Determination of individual aptitudes and abilities.
      i. For educational guidance.
      ii. For vocational counsel.
    4. Diagnosis of failures.
    5. Coöperation with the placement bureau.
    6. Measurement of the results of instruction.
  b. Relation to the theoretical interest in individual differences.

II. The Problems Classified.
  a. Devising and adapting tests.
  b. Standardizing tests.
  c. Calibrating tests: methods of scoring.
  d. Evaluating tests.
  e. Establishing norms.

III. A Program of Coöperative Research.
  a. Assembly of scattered information now available.
  b. Selection of a nucleus of uniform standard tests.
  c. Inter-laboratory coöperation on research problems.

I. The Demand

The rapidly growing demand upon the departments of psychology in colleges and universities to render immediate, practical service through the application of scientific methods of measurement to the mental traits of students, has its root

[1] Read before the American Psychological Association in New York, December 29, 1916.

in at least six distinguishable needs. The first of these appears in connection with the selection of students for admission, and takes the form of a plea for some measure of a student's native ability, with which to supplement the information obtainable from secondary school records, entrance examinations, and personal interviews with the applicants.

The need for a ready means of classifying students into sections according to ability is a second cause of the request for mentality testing of college students.

More frequently mentioned and infinitely more difficult of accomplishment is the task of testing for special abilities and vocational aptitudes, in order that the individual student may be given educational counsel and vocational direction, or, as Kitson has phrased it, in order that the curriculum may be adjusted to the student.

The adjustment of the student to the curriculum is a complementary task in which the deans and student advisors are calling upon the psychologists to assist by bringing mentality tests to bear in diagnosing the causes of a student's failure to do good work.

A fifth demand comes from the placement bureau, which seeks information regarding the abilities of the outgoing seniors with which to supplement records of scholarship and the opinions of the instructors.

The sixth demand is for a means of measuring the results of instruction and, by testing the abilities of students before and after their period of study, determining the comparative efficiency of rival schools, curricula, methods and educational ideals.

An additional motive which has impelled many to turn their efforts in the direction of mentality testing of undergraduates is one which arises from within the science itself: the scientific interest in the exploration of individual differences, their nature, amount and causes. Indeed, historically, this is the original spring of interest in student testing. (4) Moreover, many of the actual problems of testing have been solved, or will in the future be faced, by psychologists whose interest is purely scientific and who care not a whit about the possible utility of the tools they forge. Some of these scientists deplore the trend toward application, and profess a high degree of apprehension lest the pursuit of truth about human nature be deflected and led into confusion by the demands of the practical. A wiser attitude is the one which maintains a cautious circumspection regarding the possibilities and the demands of applied psychology, but finds, nevertheless, in these demands, a powerful impetus to pure sci-

ence, an augmented motive toward painstaking research, a stimulus and not a menace.

The advantages of coöperation do not, I maintain, accrue solely to the party of the second part. While striving toward an accumulation of information and insight which will have some worth for the individual tested, we are constantly elaborating methods and gathering data upon which pure psychology can draw in its studies of character, intelligence and other traits of mind. It is through the further accumulation of facts—measurements, profiles, distributions, correlations—that the psychologist of the next generation will find it possible to replace both the arm-chair analyst's hazy and verbose picture of human nature and the laboratory analyst's skeleton-like caricature of it, with an account that is both scientifically accurate and recognizably adequate to the living reality.

There ought then to be no hesitancy. The hearty support and active coöperation of workers in the realm of pure psychology is absolutely essential to the development of the applied science; and it is with confidence that we who are primarily occupied with application, turn to our colleagues of purity unimpugned for help in attacking precisely these problems of mental analysis, measurement, diagnosis and prognostication which are being forced upon us by the college administrator's demands for student testing.

II. The Problems Classified

An inventory of pertinent problems discloses a need for research in almost every quarter of the field; devising tests, standardizing tests, evaluating tests and establishing norms.

The assertion recently current that the greatest need is for an accumulation of data with tests and procedures already standardized rather than for the devising of more tests, does not hold today. We need more and better tests, particularly tests of special abilities similar to Seashore's measurements of the components of musical ability (14) or Stenquist's assembly tests (16) or Thurstone's tests of capacity to handle ideas involving relations of space and form.[2] We need also carefully graded measures of general intelligence which are more accurate in the differentiation of the higher ranges of superior adult capacity than are the Binet tests for example in differentiating capacities at the lower end of the intelligence scale. There is an insistent call—to which not many psychologists have as yet had the temerity to harken—for conative and affective tests, for measures of such compon-

[2] Not yet published.

ents of character and personality as persistence of motives, relative strength of interests, development of taste and of capacities for enjoyment. (See, however, Guy Fernald's test of grit which he calls an achievement capacity test (6); H. T. Moore's method of getting at the strength of instincts by means of association reactions (12); Kelley's measures of interests (9); Thorndike's newest scales for measuring the affective processes involved in esthetic appreciation of simple designs and of poetic quality (18); and Webb's notable attempt at demonstrating the existence of a second common factor (20).

Necessity exists not only for the invention of new tests but also for the simplification, adaptation and improvement of tests previously proposed, and for the provision of alternative and equivalent tests for use in getting repeated measures of the traits in question.

New and old tests alike call for standardization after they have been adapted to the conditions imposed by the exigencies of college testing. Standardization of a test involves not only determining the best content and form, and the best procedure that can be used in giving the directions and in providing for fore-exercise, repetitions, uniformity of incentive and so on; it also implies making the instructions clear, simple and direct—fool-proof against both the examiner and the student to be tested. Published accounts of tests can hardly err on the side of excessive simplicity and explicitness of instructions.

Still another aspect of standardization, to which all too little attention has ordinarily been accorded, is the determination of the optimal method of scoring the results. Shall a student's accuracy score in a logical inference test, for example, be the total number of right reactions, or the right minus the wrong, or the ratio of the right to the difference between the right and the wrong? This is a question that can be answered either intuitively (as it ordinarily is) or empirically by finding which method of scoring gives the best distribution and the highest correlation with some other available objective measure of the trait in question. This empirical determination of the optimal method of scoring a test for any specified purpose, we at the Carnegie Institute of Technology, following Thurstone, are accustomed to speak of as the *calibration* of the test. I venture the suggestion that some of the discouraging results recently obtained by Bell (2) from tests of students are partially attributable to the use of arbitrary instead of empirical calibrations of the tests used.

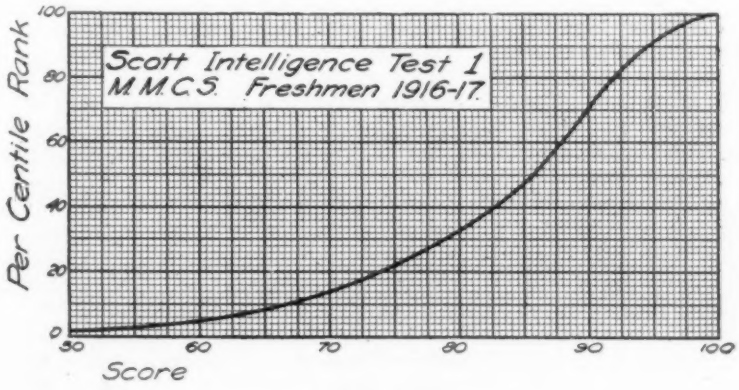
Another large group of important research problems centers about the evaluation of tests already standardized and calibrated. Just what is the psychological interpretation of each of the tests under consideration? What information of practical significance emerges from studies of correlation between the test results and estimates of intelligence, school standings, later vocational success, etc? What is the relative practicability and utility of the test in question, when compared with other tests, as to susceptibility to the effects of practice, of coaching, and of familiarity with similar test situations? To cite an illustration, just how much or how little information about a student's motor-coördination and fatiguability are lost when one gives the tapping test as a group test, using pencil and paper and ten-second trials, instead of employing tapping board and kymograph with the full procedure as specified by Wells?

In attempting to measure native intelligence how much is gained or lost by devoting an available half hour to giving Scott's complex group test No. 1 (13), instead of spending the same time in giving separate tests of opposites, verb-objects, analogies, addition, easy problems, understanding directions and matching proverbs? Numerous similar questions of relative utility are now being answered in many laboratories by the one best method of actual trial. (5, 8, 10, 11, 22.)

After a series of tests for college students have been devised or adapted, standardized and calibrated, and evaluated with reference to their psychological significance and their relative utility, there remains the stupendous task of establishing norms for the various groups to be measured and of determining the boundaries and border-line zones within which it is possible to make definite statements as to the degree of probability of a student's success or failure in the work he is undertaking.

In the laboratory which I represent, we have found it most convenient to throw our data always into the form of ogive curves of distribution or percentile graphs. These graphs are simple to plot, and blue prints of them form extremely convenient means of reference to the available norms. One sees at a glance the range, the median score, the quartiles and the ten-percentiles, and can instantly translate any new individual score into terms of precise relative rank among a hundred members of the group in question. The accompanying cut shows such a percentile distribution of the scores for accuracy in Scott's intelligence test No. 1., (13) made by 97 young women of the present entering class of the Margaret Morrison Carnegie School (the woman's vocational college of the Carnegie Institute of Technology),

on the first day of their attendance last fall. It is clear from the form of the curve that either the test is too easy for this group or the method of scoring for accuracy is not severe enough. But for immediate purposes it serves a highly useful function as a percentile scale of measurement. It is inserted here as a sample of thirty such ogives prepared this year from data on tests of students, by L. L. Thurstone, for use in our Bureau of Mental Tests.



A SAMPLE OGIVE

III. A Preliminary Program Of Coöperative Research

Such a formidable array of varied problems would discourage the psychologist who is invited to undertake the testing of college students, if he were not fully aware that already many laboratories are actively engaged in attacking precisely such tasks as these. A recent questionary by Professor Bird T. Baldwin (1) discloses no less than forty-one members of the American Psychological Association who report research now in progress on problems apparently germane to one or the other of the four main divisions of inquiry outlined above. Other psychologists, too modest perhaps, to classify their tentative efforts under the caption of research, are doing student-testing although they are not listed in the Baldwin report.

To facilitate the approach of the day when psychologists shall be in a position to render with adequacy the services which the colleges are asking of them, it is important that three steps be taken at once, toward effective coöperation.

First in importance is the assembly of information now available. Scattered through our laboratories are many files

of test data that have not been published; many minor experiments on methods of giving, calibrating or evaluating tests that have never been reported; many good ideas for new or different tests of adults which have not as yet been fully elaborated; many discoveries of labor-saving devices in the calculating and recording of results which have not as yet been passed on to other workers. It has been proposed that these accumulations be pooled, and that the American Psychological Association Committee on the Standardization of Mental Measurements be requested to aid in making this material more promptly available to all.

A second step which may soon be timely, involves the selection of a small group of tests which all can agree to use in such a uniform manner that comparison may be facilitated,—the opposites test, the analogies test, the completion test, and the logical memory test, for example.

The third step in our immediate program of research is the parcelling out among the laboratories of the numerous research problems that most need investigation: the provision of duplicate sets of tests of known equivalence; the invention of new tests and the improvement and adaptation of old ones; the comparison of group testing with individual testing; and in general the standardization, calibration and evaluation of each of the many tests whose usefulness has been suggested or already demonstrated.

The completion of such a program is not a matter of a year or a decade. Only with the accumulations of painstaking results from many laboratories over a period of years, carefully checked up by comparison with later performance of the students tested, both in their college courses, and later in the various pursuits to which their efforts are directed after graduation, will we be in a position to give to undergraduates of succeeding college generations individual counsel superior to that of unaided common sense and personal insight.

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WHAT IS APPLIED PSYCHOLOGY?

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The answer to the question: What is applied psychology? depends (a) upon the meaning of the word 'psychology', and (b) upon an understanding of the differences between 'applied' or its synonyms and 'pure' or its synonyms. The term 'psychology' may be defined from various points of view; for example, psychology is said to be the science of mind or consciousness, or the science of behavior or conduct, or the science of mental structures and functions, or, most generally, as the science of mental life. Strictly speaking, this last definition is too broad, because mental life includes, among others, the moral, aesthetic, logical and speculative aspects which are not subject-matter of psychology but belong to such mental sciences as ethics, aesthetics, logic, metaphysics, etc. To give, then, in a preliminary way a positive limitation to our term, we may define psychology as the science of mental life in its structural, functional, genetic, and social aspects, and indicate later in detail what these terms imply.

By 'applied psychology' we mean what is sometimes called practical psychology or psychotechnics or psychotechnology as opposed to 'pure' or 'theoretical' or 'general' psychology. In order to understand fully the differences between the two groups, it seems desirable to make a more extensive comparison, applicable to all 'general' and 'applied' sciences, because such a procedure will at the same time indicate the relation of applied psychology to other branches of knowledge and may thus help us to be sure of our own ground and consistent in our point of view.

It is sometimes stated that 'pure' science is interested in facts for their own sake or for the sake of merely knowing them, while applied science studies facts for utilitarian purposes. But it may be doubted whether the first of these two attitudes is ever realized in its extreme form, and if so, whether it is a truly scientific attitude. Nor is it any more reasonable to go to the other extreme and demand that each newly discovered fact should at once be assigned its utilitarian or practical value. It might be interesting to determine how many pure or abstract facts discovered more than ten years ago are still waiting for their practical application. The re-

sults of psychology, in particular, have frequently been arraigned as being too abstract and theoretical to be readily utilised in those concrete and practical events in which mental life plays an important part. This criticism is due to a failure to understand fully the differences between general and applied psychology.

Our general comparison will be based on the following five categories: aim, standpoint, problem, scope, and method, with their underlying principles. For the sake of greater transparency and easier treatment they have been condensed into the following schema, which will be further explained and illustrated by reference to various sciences in general and to general and applied psychology in particular.

In the first place, then, the ultimate *aim* of all general sciences is to extend and improve human knowledge. To appreciate its significance in the concrete, we may be permitted to indulge in a little speculation about its origin, based on the assumption that the childhood of the human race is reflected, at least in a measure, in the childhood of the individual. We may thus imagine that the first impetus to acquire knowledge came from an instinctive 'browsing' which in some of our ancestors was so strong as to manifest itself even after their more or less immediate bodily wants were satisfied and thus led to what we now call 'instinctive curiosity'; for this original, aimless browsing with its accidental rewards in the first crude discoveries probably afforded sufficient pleasure to make it self-perpetuating. The step from this leisurely browsing to an intentional searching for new and better ways of meeting certain situations probably depended upon the fact that the original discoveries could frequently be utilised. In this way the instinct of curiosity acquired a twofold biological value, for it could be indulged in either for its own satisfaction, as the forerunner of our modern 'purely intellectual pleasures'; or for the sake of making future conditions of life more comfortable, and future behavior or conduct more efficient. Now if 'pure' scientists are born and not made, they must have the browsing instinct in its 'purer', original form, for they take their keenest delight in the discovery of new truths. The aim of the applied sciences, on the other hand, is more prosaic, for they strive to enrich and improve the conditions and phases of human life and conduct, that is, they try to help us master or control difficult situations or meet them with more successful responses. This aim is attained by accumulating a body of facts bearing on these situations and responses, while the actual application of this knowledge is carried on by the practical expert. We have thus a *science* and an *art*

General or Pure or Theoretical Sciences	Practical or Applied Sciences or Technology
AIM	
To extend and improve Human Knowledge	To extend and improve the conditions and phases of Human Life and Conduct
STANDPOINT	
of Objectivity or Universal Validity as expressed in Scientific Laws	of Subjective Particularity or Individual Interest in Utility
SCOPE	
depends upon Inherent Similarity of all facts of a science or aspects of knowledge	depends upon Inherent Frequency of factors composing concrete events
PROBLEM	
to discover or establish instances of universal similarity or validity to trace their origin or development to explain their causal connections	to analyse situations and responses (or events) into variable and constant or essential and unessential components to trace their interrelations to modify these components so as to produce same results more efficiently
METHOD	
Observation and Experimentation identical as to Comparison, Repetition, Accumulation, Modification, Elimination, Measurement, different as to Simplification, Isolation, Abstraction, Induction, and Classification	Observation and Experimentation identical as to Comparison, Repetition, Accumulation, Modification, Elimination, Measurement, different as to Differentiation, Separation, Correlation, Deduction, and Standardization

of teaching, of medicine, of engineering, of agriculture, etc. To be sure, sometimes both science and art are represented in the same person; but likewise pure and applied science may occur in the same individual, as when a psychologist interested in the problems of color-blindness engages in testing his sub-

jects for the purpose of showing them how best to overcome their handicap. As a matter of fact, the distinctions which are to be drawn in this paper between pure and applied sciences are perhaps somewhat overemphasised for the purpose of clearer *thinking* and better *understanding* only, and it is readily granted that in actual practice there are many transitions and fusions.

The ultimate aim of pure psychology is, according to the general principle, to extend and improve our knowledge of mental life with regard to its structural, functional, genetic, and social aspects. We do not use the phrase 'mental life' in any technical sense, but include in it all varieties of conscious and semi-conscious experiences in their normal, subnormal, and abnormal forms and in their fully and incompletely developed stages, both in human and other living beings. By the structural aspects of mental life we have reference to the most common elementary and complex experiences ranging from the simplest and more or less abstract and meaningless sense-impressions through the perceptions of external objects and their interpretations to the highest forms of intellectual complexity, as ideas, concepts, judgments, thoughts and also the emotions and voluntary choices and actions. The functional aspects involve the organization of our experiences on the basis of attention, memory, recognition, imagination, comparison, and reasoning. The genetic aspects include the development of mental life in the individual and in the race, while the social aspects involve those changes in mental life which are due to the social intercourse among human beings. We might summarise these statements by saying that general psychology aims to study the ultimate or essential nature and constitution of mental life or experience as a whole. While, for example it tries to find out how we reason and form judgments, it does not seek to determine whether our judgments are logically correct, or morally sound, or aesthetically valuable or in harmony with other metaphysical speculations.

On the other hand, applied psychology aims to investigate and improve those conditions and phases of human life and conduct which involve mental life, especially in its social aspects, since practically all human activity is nowadays carried on as a function of social intercourse. The solidarity and vital fitness of human society does not so much depend upon the physical likeness of its members as upon the harmonious interaction of their minds, which are of such great variety and complexity that any two of them will resemble each other only in a general way. And yet these minds are constantly entering into each other's situations to which prompt and sometimes

delicately balanced responses are required from both parties. In such events mental life is perhaps the most important factor, because it complicates the conditions and phases of human response or behavior to an unpredictable degree. These situations require therefore careful study, in order to improve, if possible, the conditions under which the two parties have to react upon each other and thereby exert also a beneficial influence upon their mental life.

Every discovery of a new fact, intentional or unintentional, is of course an extension of human knowledge and an enlargement of the conditions of human life and conduct. But it cannot help to improve either unless it can be viewed from certain scientific standpoints. Radio-activity, for example, remained an isolated, unintelligible phenomenon until it could be incorporated into physics as fitting under its well established laws of nature. And as soon as this was accomplished, radium began to exert its beneficial influence upon human life and conduct. The general sciences take for their *standpoint* an objective attitude which transcends the interests of the individual and looks for the universal validity of their facts that is expressed in the form of scientific laws. To use an example from psychology, take the fact that human beings can pay attention. General psychology, accordingly, asks, in which forms and stages of mental life is attention possible, what is attention, how many kinds or degrees of it occur, how long may it last, how many items may it include in a single moment, how does it change with age, sex, inheritance, and environment? and like questions. The answers give us the psychological laws of attention. Like other sciences, general psychology purposely eliminates or disregards unessential details and especially accidental individual differences, because they obscure the universal validity of its laws. Consequently, all scientific laws involve the assumption that all essential conditions remain constant.

In the case of the applied sciences, however, the standpoint is the very opposite. Here every concrete situation is an object of investigation in itself, appealing to the subjective interests of certain individuals on account of its immediate utility or threatening harmfulness. It becomes now a question, for example, how the law of gravity can be applied to aerial navigation, or, how certain laws of chemical action can be used in fighting particular diseases, etc. The significance of this principle of subjective particularity for the standpoint of applied psychology is obvious. While general psychology, for example, reduces our daily actions to a universal schema typified in the simple reaction experiment,

applied psychology studies these same actions as nearly in their original complexity and concreteness as experimental control of conditions will allow; and the more this ideal is approached, the more applicable will be the results. Recall, for example, the testing of witnesses as to their fidelity, reliability, credulity, suggestibility, etc., or the studies of the influence of humidity and temperature on quality and quantity of work produced, or the diagnosis for musical ability, or the effectiveness of certain advertisements, and others. In all these cases the situations presented to the individual tested and the responses required from them are usually very similar to those found in actual life. Consequently, the results obtained should not be generalized to the extent of making them seem applicable to different circumstances or different individuals. In other words, we should not expect applied psychology to arrive at scientific laws of universal validity.

The rapid accumulation of scientific results since the days of Aristotle, and especially during the last three centuries, has made it absolutely necessary to classify all items of human knowledge into separate sciences, whose *scope* and subject-matter must be definitely outlined according to certain ultimate principles. In the case of the pure sciences the principle involved is that of the inherent similarity of the facts grouped together, so that, for example, observations on the atomic constitution of the universe or its parts belong to chemistry, while the structural and functional elements and interrelations of the same universe and its parts belong to the physical sciences. Again, the same universe in so far as it exhibits signs of life, past, present or future, is studied by the biological sciences; and in so far as it manifests mental life it belongs to the mental and historical sciences. It is thus evident that at bottom the scope of all pure sciences is the same, but the grouping and relating of facts is based upon the inherent similarities of the facts or aspects of knowledge. To indicate the scope of general psychology in particular, it confines itself, as pointed out before, to the structural, functional, genetic, and social aspects of mental life wherever it is mainfested. It is therefore not limited to the human normal adult individual, but its various branches include also the mental life of infants, children, adolescents, senescents, of abnormal and subnormal persons, of savages and civilized people, past and present, of small and large social units, and also of animals and plants. One of the special branches studies the relations between mental changes and physical changes in the external world, while another branch seeks to correlate mental and neural changes.

In all these branches the standpoint remains the same, that is, they study mental changes with a view toward the universal validity of the facts discovered.

The scope of the applied sciences is based on an entirely different principle. Here such facts are grouped together under a single science which frequently constitute the same concrete situation or require the same concrete response from human beings. Thus the various branches of the science of engineering are differentiated from each other on the basis of specialized tasks and divided into mechanical, civil, naval, sanitary, architectural, efficiency, illuminating, and other kinds of engineering, each group trying to meet certain situations whose inherent resemblance is based on their complexity, that is, on the concurrence of similar factors in similar arrangements. If one examines the factors which constitute a concrete situation from the standpoint of the general sciences to which they may belong, one will find in most cases a number of such sciences are represented which are sometimes not very closely related to each other. Consequently, in order to specialise in any single applied science it is necessary to study at least to some extent all those general sciences upon which its facts are based. Hence the student of medicine, to give a single example, is required to know biology, physics, chemistry, and sometimes psychology, besides anatomy, physiology, embryology, pathology, etc. Still more extensive must be the foundations of applied psychology, because its scope includes every possible situation or response which involves mental life. Since it is impossible within the short span of a human life-time to cover this ground, it becomes necessary to develop special branches of applied psychology which are to be cultivated by specialists in each field. So far the development of these subdivisions has been left to chance interests of individuals or to public demands. But the time seems ripe to systematize and organize the efforts of building up an applied psychology equal in rank to that of other applied sciences, and the author hopes that this task will be faciliated by the Journal of Applied Psychology, the plans for which had been slowly shaping themselves in his mind for some time.

In outlining the scope of applied psychology we cannot be confined to the field as so far actually cultivated, but must include in our discussion the possible extensions which are provided for in the formulation of the general principle as adapted to our special topic. According to it the scope of applied psychology is the study of those conditions of human life and conduct, that is, those concrete situations and responses, in which the mental life of human beings is an im-

portant factor. The *situations* may be roughly classified into three groups, namely, those which arise (a) from the individual's hereditary equipment, (b) from his physical environment, and (c) from his social environment. The first division would include the study of individual mentalities of sex, age, race, special talent, genius, criminal, types of character, individual differences and such defects in mental equipment as do not involve abnormalities but only developmental retardation; and this branch might be called *diagnostic psychology*. The next subdivision will study the influences of climate, weather, humidity, temperature, nutrition, sanitational and other environmental conditions upon mental life and receive the name environmental or better *bionomic psychology*. The third group comprises the influences of tradition, customs, beliefs, superstitions, myths, religions, panics, wars, strikes, and such institutional forces as administration, organization, discipline, and others, upon the mental life of the individual or the group and may therefore be called *socionomic psychology*. It is to be distinguished from social or sociologic psychology, which is a branch of general psychology, not only by scope, but also by aim, standpoint, problem and method.—The *responses* which involve mental life may also be grouped into three classes, (a) vocational, (b) recreational, and (c) communicational activities. The *psychology of vocational activities* will include the study of mental factors involved, for example, in legal, medical, educational, industrial, commercial, and other skilled and unskilled work. The *psychology of recreational activities* will study, among other topics, the mental life involved in artistic creations and enjoyments, in playing games and musical instruments, in singing, taking part in sports and athletics, in more passive amusements, in pursuing hobbies and similar pastimes and other leisurely occupations. The *psychology of communicational activities,* finally, will investigate the mental factors involved in reading, writing, speaking, stuttering, using gestures and other symbols, signals and codes, typewriting, stenography, telegraphy, telephoning, printing, interpreting, translating, and the like. To be sure, there may be overlappings, as the same activity may be used for all three purposes; but when this is the case, there will be found also significant mental differences. Nothing has been said here of the psychology of learning, because it may belong into both, general and applied psychology, according to its treatment.

A complete bibliography or a historical sketch of psychology would show that some of the topics here mentioned have been investigated in the very early stages of our science, for in-

stance, reading, writing, religion, beliefs, superstitions, and certain aesthetic experiences. Other topics have begun to occupy the center of interest more recently, as those of individual differences, defects, studies of humidity and temperature, examinations of witnesses, business appeals, and others. Some topics, finally, have not yet received much or any attention, as character-diagnosis, nutritional influences, administrative and disciplinary factors, salesmanship, amusements, and others. Only three of all these numerous topics have so far had their own organs of publicity, the psychology of religious experiences, of education, and of retardation; all the other topics will find representation in the new Journal of Applied Psychology.

The difference in scope between the general and applied sciences is intimately connected with a wide difference in their *problems*. It is frequently stated that the general sciences have at least three or four chief problems, briefly enumerated as those of analysis, synthesis, genesis, and explanation. The first two consist in the discovery and establishment of new instances of universal similarity and validity, the third involves the question of origin and development, and the last searches for causal connections. In some sciences the third, in others, the fourth problem, is of minor importance. In general psychology all four receive about equal attention. The object of analysis is to reduce mental life to its most elementary experiences and to describe the structural composition of mental complexes. The problem of synthesis is to discover the universally valid laws of these elementary and complex experiences and especially to describe their functions in the general course of mental life. The question of mental development is attacked by genetic psychology, which includes child-study, racial, social, and anthropological enquiries. Finally, the problem of explanation is to investigate the relations of mental life to concomitant physical and physiological phenomena.

The problems of the applied sciences are in so far similar as they also include analysis and explanation. Since, however, they deal with complex situations as the conditions of human life and conduct, their first problem is an analysis of these situations, but not for the sake of establishing ultimate elements and universal validity, but rather for the purpose of discovering their constant and variable, or essential and unessential components or contributing factors. The second problem consists in a similar analysis of the responses depending on the particular situations investigated, again for the sake of finding their essential and unessential or constant and variable factors. In a third group of problems an explana-

tion of the interrelations between the situations and responses is aimed at and frequently involves a quantitative or statistical enquiry. The last and perhaps most important problem is to find means of modifying either situations or responses or both in such a way as to attain the same or better results with greater economy of the essential components. Again, as in the case of the general sciences, these four kinds of problems are not of equal weight in all of the applied sciences or in all of their investigations.

Let us illustrate these four problems by a topic of civil engineering, namely, road-building. (1) Among the components of the situation are: a survey of the country through which a new road is to be laid, a measurement of its elevations, a study of its drainage, both on the surface and below it, an analysis of the soil, a study of geological obstructions, of climatic and weather influences, a consideration of the distance of building material and the methods of hauling it, of other existing means of traffic, as rivers, canals, railroads, branch and cross roads, and of the location of communities, dwellings, schoolhouses, churches, stores and similar other social centers of the neighborhoods. (2) An analysis of the responses or phases of human behavior involved will reveal among others the following components: vehicles of traffic used by the inhabitants, the latter's purposes of building the new road, weight of the goods to be shipped over it and of the vehicles used, the desire of avoiding either steep grades or long detours, and the like. (3) The problem of the interrelations between these and the former components require the consideration of the possible width of the road, of its general direction, of grading and shading, of junctions or crossings with other lines of traffic, and of avoidance of sharp curves or hidden turns. (4) The last problem consists in an enquiry into original cost of construction and material, into future expenses of repairs and upkeep, into avoidance of unnecessary bridges, railroad crossings or tunnels, into value of traffic served by the road, and other items.

To consider now the case of applied psychology, the first chief problem is to analyse the mental components of certain situations or conditions of human behavior. A good example may be found in the psychology of salesmanship. Here we have to deal either with the travelling salesman or the travelling customer. The latter may be in one of three possible states of mind, (a) he may know what particular article he wants to buy when entering a store, or (b) he may know what kind of an article he wants to buy, or (c) he may merely want to look around, without definite intentions of buying

anything. Each of these states may be further analysed. Among the mental components of (a) may be: a definite idea of the article wanted as to size, color, shape, price, brand, packing, etc.; a definite purpose for the article, a definite or indefinite idea as to where to buy it or try to do so, a definite purpose to buy it, and a definite or indefinite plan as to the next important step after the purchase, manifested frequently by an attitude of haste or of leisure. The salesclerk's responses should be regulated by a knowledge of such components just as much as by the circumstances as to whether the desired article is in stock or "just out." Here, however, we are touching upon the second problem of applied psychology, an analysis of the mental components of human behavior. To continue our previous example, the sales-clerk's response may be of the listless, mechanical, indifferent sort revealing a minimum of mental life,—as is frequently seen in booths for selling tickets to some exhibition or in department stores selling only very low-priced goods,—or it may be inattentive, distracted, as if disturbed by the customer's appearance, and manifesting a lack of interest in the process of the sale, or it may be of the quick, alert, interested, attentive kind that is ready to pierce the customer's mind and to read his thoughts, for the purpose of selling him something else. To proceed now to the third problem, applied psychology has to show the relations of the mental components of the response to the components of the situations. Thus the response of the mechanical, listless sales-clerk may have been conditioned by fatigue, or underfeeding, or poor health, or lack of experience, or underpay, or the like. The last problem of applied psychology is to modify or improve the essential components in situations or responses or both in such a way as to help attain more efficient results. Of course in any concrete case it is necessary that all the other essential non-mental components be likewise improved, otherwise they might offset or destroy any changes that the former might have brought about. This is, of course, the work of the practical expert, but his knowledge of the ways of improving the whole event must come from the various applied sciences that are relevant to the case in question. Illustrations of both, the balanced and the unbalanced efforts of improvement are frequently found among advertisements. Thus an advertisement may be constructed correctly according to psychological principles, but appear in a poor medium, or at the wrong time, or in the wrong community. For example, the writer has in mind a beautiful and attractive streetcar poster of a certain well-known summer school exhibited in a community of another

state in which a large summer school was conducted. More frequently it happens that an advertisement correctly employs certain essential psychological principles but violates certain others just as essential. Such mistakes are due, as a rule, to an incomplete analysis of the situation or the expected response.

Since the problems of the general and applied sciences are in partial agreement, that is, in so far as they involve analysis and explanation, we may expect that the two groups will be similar, to some extent at least, with regard to their *method* of investigation, which is the last point of comparison in our schema. In general, both groups of sciences may be said to depend upon the method of observation for the accumulation of their facts, and the more detailed procedure will include the processes of comparison, repetition, modification, elimination, and measurement. These steps are facilitated by the use of experimental control of the factors under investigation. In the general sciences this control is as a rule very rigid and refined and makes it possible to greatly simplify the conditions by isolating the desired components, sometimes with the additional help of mental abstraction, until as a result the ultimate, unanalysable elements are discovered. The latter may then be recombined in old and new ways, and by this inductive procedure the universal validity of their laws is established. For an illustration let us watch the botanist in his study of the nutritive processes of a certain plant. He will plant a large number of seeds of that plant in various kinds of soil, which he has either artificially prepared by mixing or whose chemical composition he has otherwise previously analysed. The amounts of water, heat, light, etc., administered daily to each specimen are carefully measured and recorded and the rate of growth is observed in minute detail, including among others the number, size, and first appearance of roots, stems, leaves, buds, flowers, fruit, etc. These observations are repeated, sometimes for years, and with still further modifications until all accidental factors are eliminated. The results are then compared with a careful microscopical analysis of the cells of the different parts of the plant, and any doubtful facts must be repeatedly tested and verified, before a universally valid description of the nutritive processes of this plant is obtained. On the basis of the results obtained the plant receives a certain classification in the botanial system. Such is, if not always the actual, at least the ideal method, and with minor variations, due mostly to differences in subject-matter, it is also employed by general psychology. Again, in any single investigation of some particular problem some of these

steps may be omitted, others may have to be very much extended, while some may be combined into a single act. Likewise the actual temporal order of these stages in the procedure may vary from time to time, both in the general and the applied sciences.

The latter differ from the former in several respects. Since their problem of analysis is not to find ultimate elements, but to single out the constant from the variable or the essential from the unessential components, they do not have to carry the process of simplification to the highest degree, so that they may substitute for it the methods of differentiation and separation. Furthermore, since they always deal with a concrete situation or response, a too rigid and refined control of conditions might destroy the object of investigation and either substitute for it an artificial product which is not true to life, or at least prevent the study of the relations of the components to each other and to the concrete whole. The latter step constitutes the method of correlation and takes the place of induction. It is often supplemented by a process of deduction which consists in referring the separated components to the laws of the corresponding general science and inferring from them such changes in the concrete event under investigation as promise more efficient results in the end. This leads to the last step in the method, that of standardization, which takes the place of classification and is based, in part at least, on the results obtained by the corresponding general sciences. Standardization thus is the process by which the fourth problem of the applied sciences is to be solved.

With the exception of this last step the differences in the methods of the two groups of sciences are in some cases very much obliterated. Nevertheless it seems important to keep the two separated in thought at least, in order to avoid confusions and conflicts in actual practice. Thus a clear understanding of these differences will be helpful in deciding the present claims of the value of mental tests. An attempt to settle this dispute is of course beyond the scope of this paper, although it is hoped that the latter may contribute its share toward a satisfactory solution of the difficulties involved. Instead, it seems more appropriate to conclude with a concrete illustration of the experimental procedure in a problem of applied psychology.

Suppose, then, it was desired to discover which persons out of ten possible suspects had been witnesses of or taken part in a certain event, especially as the participants might try to conceal connection with it. The first thing to do is to obtain, or if necessary to construct, a standardized list of one

hundred irrelevant words which are sufficiently general in character and which refer to nearly every possible general topic of life except to the event in question. Then make out a new list of 25 to 50 'relevant' words, each referring more or less pointedly to some phase of this event, (this step involves differentiation). Then mix the two lists in such a way that there are always two or three irrelevant words in succession, but the relevant words are sometimes scattered singly amongst them, sometimes follow in small groups of two, three, or four (modification). Now submit each of the ten subjects singly (separation) to the following tests: after explaining and illustrating to the subject that he is to respond as quickly as possible to each word said to him with the first word occurring to him, pronounce the first word and at the same time start a stopwatch. As soon as the subject begins to reply stop the watch, write down what he says and the length of time it took to answer (measurement). This process is continued until the complete list has been submitted. At a later trial (repetition) the following modification may be introduced: ask the subject to respond as quickly as possible, whenever he can, with the same word that he used before, but if it does not readilly recur to give the very first new word that comes to his mind. Calculate next the time averages and their mean variations for each whole list, for the irrelevant, and the relevant words separately and correlate them with the kind of replies given. A comparison of the quantitative and qualitative data will help in the elimination of those persons whose results show no marked differences in their responses to the relevant and irrelevant words. In the case of the others it is not only possible, by deduction from the general laws of emotion, to say that they have been present at the event, but one may sometimes infer from the nature of their replies to what extent they have taken part in the concealed event. We have not indicated in this abbreviated illustration the various precautions that may be necessary in order to control the conditions of experimentation and that should be considered essential factors in the method.

In place of a summary of this systematic enquiry into the nature of applied psychology a final word may be said about the relations between applied psychology as a *science* and as the *art* of making practical applications of its results to concrete events in daily life. The question is sometimes raised: Are the scientific results of psychology so fully established that we are justified in making practical use of them? An affirmative answer can be given only with reference to a few topics, and even here only with certain limitations and quali-

fications. A true selection of these topics can be made only by a psychologist who is a specialist and thoroughly familiar with the whole field of his science, and all applications should be made either under his supervision or with his full approval. But if he wishes to make the applications himself, he thus becomes a practical expert, and it becomes now necessary for him to study also the practical field in which he wishes to work. Take the case of advertising. As a psychologist he may be able to analyse the mental factors entering into this work, but there are many more items of a very technical nature, such as a knowledge of printers' types and cuts, of newspaper organization, of articles advertised, of other mediums, and so on, without which he could not become an expert writer of advertisements. On the other hand, the professional writer of advertisements cannot intelligently and successfully employ psychological principles without a fair knowledge of the two branches of the science, because there is no single universal principle that can be applied equally well to all kinds of advertisements, so that in each case he has to make a careful selection and balance of all factors involved. This principle of subjective particularity, as we have called it, holds true of all concrete events involving mental life, and its recognition will prevent many wrong expectations or disappointments with regard to the immediate benefits to be derived from applied psychology.

A FOURTH METHOD OF CHECKING RESULTS IN VOCATIONAL SELECTION

By WALTER DILL SCOTT,
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There need be no confusion between vocational guidance and vocational selection. The two are totally distinct in purpose, method of procedure and certainty of results.

The purpose of vocational guidance is to select from all possible vocations that one for which a particular individual is best suited. The purpose of vocational selection is to select for a particular position that one of the applicants who is most likely to succeed in it.

The method of procedure in vocational guidance is to analyze all possible vocations and then to analyze the entire personality of the individual in order that he may be guided into that particular vocation for which he possesses the greatest aptitude or which affords him the greatest possibilities. The method of procedure in vocational selection is to analyze a single vocation, to test applicants as to their fitness for the single function or for the complex of functions involved in this vocation.

The vocational 'guider' has developed no adequate method of checking the certainty or the wisdom of his advice. If he advises Johnny to become a plumber it is quite possible that another equally wise guider would advise against such action. We know nothing of the agreement between the judgments pronounced by each of a group of experienced advisors all working under the same conditions. If he advise Johnny to become a plumber, Johnny may learn the trade, but succeed only indifferently. Such a failure on Johnny's part can not be construed as conclusive evidence against the wisdom of the guider's advice. If Johnny had entered any other trade or profession his failure might have been more disastrous. Even if Johnny had succeeded as a plumber the wisdom of the advice of his guider would not be conclusive. Johnny might possibly have had a much greater career if he had been directed to dentistry. This unusual difficulty of checking results in vocational guidance has given increased importance to vocational selection as a field

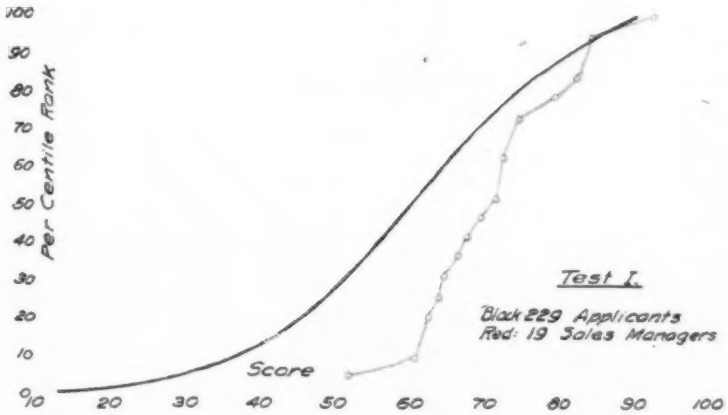
for research and for training for those who hope ultimately to advance the cause of vocational guidance.

Before any method of vocational selection is put into practice, its adequacy is easily checked; checks for estimating the value of a series of special tests have been worked out in actual practice. If, for example, the task is to select salesmen for a particular commodity to be sold under recognized conditions, the sales-manager can readily try out the tests in advance by the following method. Let him select from his present force of salesmen working under these conditions ten successful salesmen, ten who are moderately successful and ten who have not been even moderately successful. Let him arrange these thirty in rank order from best to poorest. Let his rank order then be combined with the rankings made independently by two or more executives of the firm who are acquainted with the salesmen and their work. This combined ranking may be spoken of as the Firm Rank, and should agree closely with the rankings of the thirty, secured from the tests, if the tests are dependable. In actual practice a correlation is frequently secured in excess of 75.

A second device for checking the tests is to have experienced men tested with the applicants. If a man has already proved himself successful in a given position and then is tested with applicants for the position, he should make a good showing if the tests are adequate. Correspondingly, the man who has been thoroughly tried in the position and has failed should not be able to make a good showing if he takes the tests with the applicants. Men of known ability appearing with applicants may be called 'Ringers' and are useful in checking the adequacy of the method of giving the tests.

There is a third check on tests that is the most dependable of all, but which is not available until after the tests have been put into operation. This may be called Vocational Accomplishments and consists in comparing the ratings received in the tests with the later accomplishments in the vocation. No man engaged in vocational selection should rest content in giving any tests that are not being constantly approved by this most crucial of all checks.

The three checks mentioned above are all being successfully used, but each offers certain obstacles. It is sometimes difficult to induce executives to provide the Firm Rank. The star Ringer is compelled to masquerade as a novice. The unsuccessful Ringer is frequently unwilling to take the tests. The reports on the Vocational Accomplishments are unavailable for weeks or even for years.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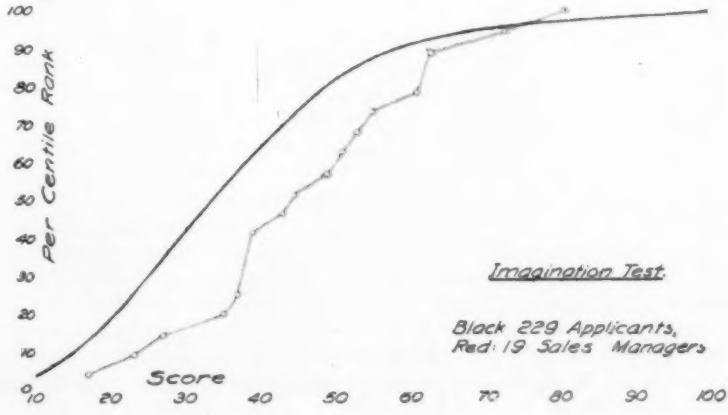
Test I.
Black 229 Applicants
Red: 19 Sales Managers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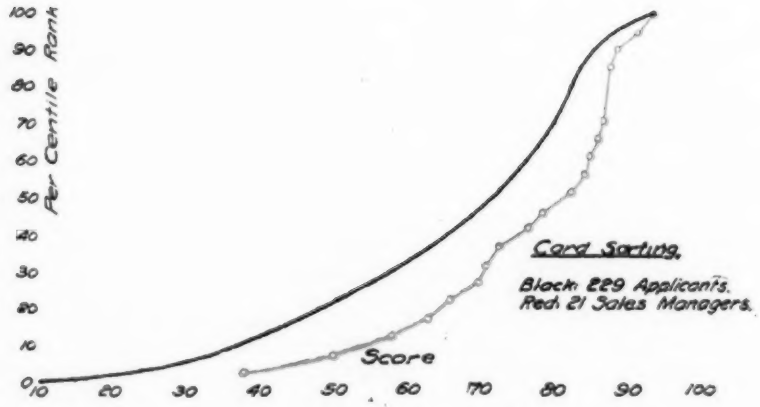
Imagination Test.
Black 229 Applicants,
Red: 19 Sales Managers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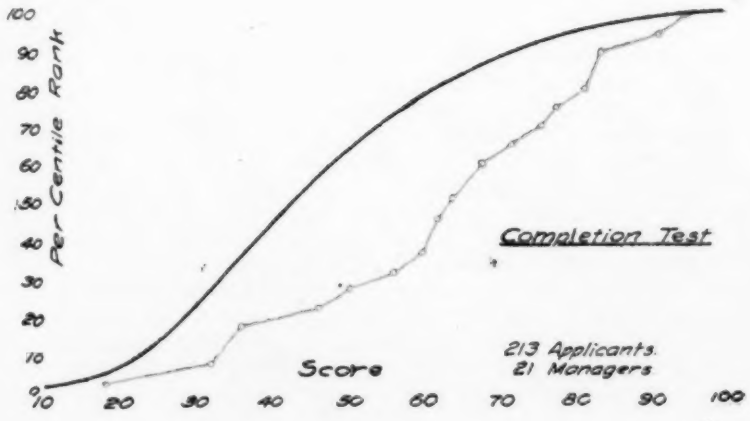
Card Sorting.
Black 229 Applicants.
Red 21 Sales Managers.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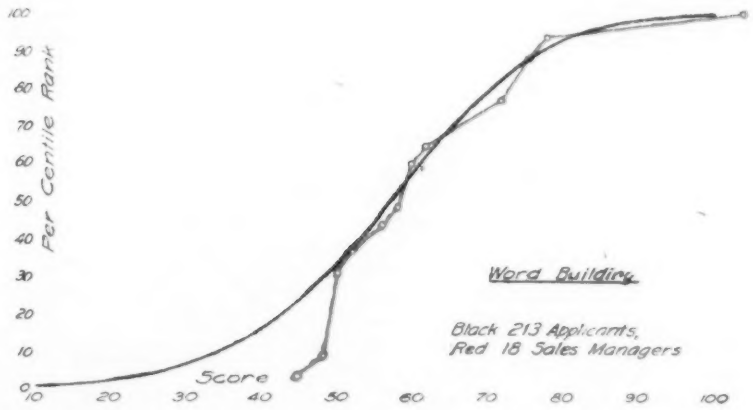
Score
Completion Test
213 Applicants.
21 Managers



There is a fourth method for checking tests for vocational selection. This method may be designated the Applicants-Experts method. A concrete illustration will make this method clear.

About two hundred and thirty applicants had been recommended for a selling position by the officials of a large selling company. For a period of years about 85 per cent. of all applicants recommended for appointment failed, resigned, or were discharged. It is only fair to assume that these two hundred and thirty men were a typical group, and that 85 per cent. of them, if appointed, would fail. Before appointment the men were all subjected to a series of tests. In the territories where these two hundred and thirty applicants were being tested about twenty 'managers' were induced to take the tests with the applicants. These twenty 'managers' had all succeeded in the task for which the applicants were being sought. The term Applicants as used here refers to that group, 85 per cent, of whom would later fail. The term Experts refers to those who have, at least in a moderate degree, succeeded. The accomplishment of the two groups in the tests is indicated in Charts I to VI. In all the charts the figures on the base line indicate the scores received in the test. The numbers in the vertical column to the left indicate the percentage of the group securing that particular grade or worse. Thus 50 per cent. of the Applicants received in Test I a grade of less than 60; only one of the Experts received a grade of less than 60.

As will be seen at once from a glance at the charts, each of the tests separated the groups fairly well with the single exception of the Word-Building Test.

The conclusions from this fourth check are obvious. The Word-Building Test fails to differentiate the doubtful from the successful group. Unless there is some reason to the contrary it should be dropped from the battery of tests for this company. Test II is too difficult for either group, but still it differentiates the groups. Tests I, III and IV are very satisfactory in differentiating the groups.

Test I is a test of general intelligence, consisting of opposites, mixed relationship, etc. Test II is an unpublished test of imagination of the constructive type. Test III is a modification of Thorndike's card-sorting test. Test IV is a modification of Trabue's completion test. The Word-Building test is the well-known Whipple test. In all instances eight tests were given the applicants. Only the five referred to above were given the 'managers'.

MENTAL HYGIENE AND THE IMPORTANCE OF INVESTIGATING IT *

By LILLIEN J. MARTIN, Consulting Psychologist, San Francisco, Cal.

The subject should have been stated on the program as Personal Mental Hygiene and the Importance of Investigating it, to distinguish it from the sociological mental hygiene work which is at present being carried on by the Mental Hygiene Society. By mental hygiene I mean the psychological work to be done in creating, maintaining and restoring normal mental activity in a given individual. There are many reasons why our association should immediately take the lead, set the pace as it were, in this matter of mental hygiene by either appointing a committee to prepare a report for publication in which the different phases of the mental hygiene work could be distributed among its various members in such a way that each subject would be treated by the one best prepared to undertake the work in the particular line, or if it seems undesirable to appoint a committee to prepare a report for publication on mental hygiene until the matter has been taken up and discussed by the association as a whole, would it not be well for the association to set aside at least one of next year's sessions for the considering of this subject.

The three most important reasons why the association ought to investigate the subject of mental hygiene is *first*—the fact that mental testing which should have a therapeutic end in view is nearly everywhere too largely satisfied with diagnostic work; *second*—the fact that there is an almost universal use of some form of mental hygiene and that such use largely lacks the scientific character which it should possess in view of our present psychological knowledge, and *thirdly*—because many of the best physicians would be glad to have the number of their therapeutic methods increased. In considering the opening of an office as consulting psychologist I had an experience recently which shows the desirability of our association taking the initiative in the mental treatment of disease by publishing something in the way of a preliminary report. I visited some thirty of the leading physicians of San Fran-

* Presented at the New York Meeting of the American Psychological Association, Dec., 1916.

cisco to inquire whether they thought there was any opportunity for work there along the line of personal mental hygiene. With one exception, where the physician was doubtful they replied "yes". A few physicians went so far as to say that mental hygiene was the next step in medicine and two of them actually offered me an office without any expense to myself. The fact is, the physicians are coming to realize that they have neither the time nor the knowledge to make proper use themselves of mental hygiene in their practice, and if they do not see to it that it is taken up by persons prepared to undertake it scientifically it will be attempted by those not properly equipped.

The investigating and applying of mental hygiene looks in many directions:

1st: To the methods and the psychological material to be used in teaching it to freshmen and other students in colleges and universities who are entirely ignorant of the laws governing mental action and indeed scarcely aware that people possess minds. An examination of the curriculum of the various American universities and colleges will show that while lectures are everywhere given in physical hygiene scarcely ever is mental hygiene taken up in a place which has largely to do with the activity of the human mind. That mental hygiene is not given in the lectures on general psychology is shown by examining the content of the various psychological text books published by college professors. Such silence in regard to mental hygiene cannot be attributed to psychological ignorance, for we have already collected a large number of laws regarding memory, attention, imitation, suggestion, habit, fatigue, etc., which would greatly help the student to understand and improve his own mental and physical activity. Of course, such a psychological discussion as the one proposed is bound to bring up old and unsettled questions—that of transfer of practice is one that immediately suggests itself. What we do need to do is to get together our psychological knowledge and decide what would be most valuable to present in the way of intellectual and emotional guidance not alone to the college student but to all persons desiring to improve and develop their ability to think correctly. That is, it seems to me that in view of the silence of psychological text books in general regarding mental hygiene this association should now collect and summarize in printed form such material as is now available in the form of syllabi and other unpublished writings whereby psychologists may, so to speak, pool their knowledge along this line in order that students may have presented in lectures on

mental hygiene that which will be most useful to them in their subsequent university work and in later life. Such a report might also be made very useful to the teacher of psychology in meeting the needs of those outside the university who inquire of him as to the best methods of improving the memory, training the attention, etc., for aid in controlling and strengthening the intellectual life.

2nd. To the making of a curtailed summary and a critical study of the work that has been done by psychologists and others in applying mental hygiene to the preventing and removing of mental and physical weakness and disease, and to an expression of opinion regarding the general value of the various remedial mental methods employed.

3rd. To a brief presentation of investigations along psychological and physiological lines which have a significance from the standpoint of mental hygiene although not directly concerned with it. From the standpoint of physiology the interesting work along this line of one of our members, Dr. Cannon, immediately occurs to one as a contribution to this subject. Even psychological work which at first thought seems to offer little that would be of mental hygiene value I suspect will be very suggestive when one examines it closely from the point of view of mental hygiene. Experiments with weights which have been sometimes considered laborious and even tedious at once occur to me as offering material useful from a mental hygiene standpoint.

4th. To the gathering of suggestions from physicians having a psychological turn of mind who are working in other medical departments as well as that of psychiatry as to the particular fields of mental hygiene which their experience suggests as the most desirable and promising for investigation. There are, of course, certain fields as that of adolescence and senility the importance of investigating which will be evident to those having no special medical training.

5th. To the examination of the present statute laws in the various States governing the diagnosis and treatment of mental and physical disease which should be made to ascertain whether a modification of old laws is not needed and whether some new laws should not be introduced to aid in the putting of mental hygiene on a more scientific and satisfactory basis. The question at issue is really whether the work of the psychologist in mental hygiene is to be one of working entirely under a physician or whether his opinion on the data obtained is to be regarded as final, whether, as in the case of the chemist

who makes the urine analysis, or the physicist who makes an X-ray examination, the data are to be submitted to the regular physician often possessing little or no psychological training, for final examination and decision.

Other matters needing consideration will doubtless occur to you which should be discussed in a report on mental hygiene or taken up in a discussion at a session of the association set apart for this purpose. In conclusion I will say, that I shall bring up this matter at the business meeting tonight and I very much hope that others will think also that our association should not longer ignore the thorough consideration of personal mental hygiene.

A COMPARATIVE STUDY OF WHITE AND NEGRO CHILDREN[1]

By DAGNY SUNNE, Ph.D.

As New Orleans offers unusual opportunity for comparative study, an investigation was begun last year to compare white and negro children of nearly similar social and economic status by means of the Binet and Yerkes Point Scales and other tests. All the white children above grade II in a school situated in one of the very poorest districts were selected for examination in order to have environmental and school conditions as nearly similar as possible to those of negro children of corresponding age and grade. It was hoped that the results would indicate whether the ordinary school program is as well adapted to the negro children as to the white. The purpose was not so much to get a general intelligence quotient, as to find out specific points of similarity and difference. The children, white and negro, attend public schools in the same district. The white children were tested first and then an almost equal number of negro children of as nearly the same age and grade as possible. Each child was examined individually by the investigator. The superintendent, principals and teachers cooperated heartily in the investigation, and the children, who assumed that it was merely a new kind of school exercise, were eager for the tests and seemed to do their best. Both principals and teachers were unaware that the tests were made for a comparative purpose. No children below the second grade were examined as it was desired to employ other tests that required the ability to write and to use colored crayons. The white children are mainly of Irish, German, Italian and French ancestry, but all are natives of New Orleans. In only two families is a foreign tongue used to any extent in the home, and few of the children can understand even a word of the language of their parents. Consequently all of these boys and girls may be considered English-speaking children. The white children tested by both scales numbered 112, 47 girls and 65 boys, from grades II to V inclusive; 116 negro children of corresponding

[1] From the Callender Laboratory of Psychology and Education, Newcomb College, New Orleans, La.

grades, 54 girls and 62 boys, besides 8 girls and 2 boys of the VI and VII grades, 126 in all. Thus 238 children were examined under exactly similar conditions.

According to school grades, the negro children are more retarded than the white as regards both gross percentage and amount, the differences being 10% and .2 year. However, the percentage of retardation is the same for both groups in grade II, and a little less for the negro than for the white in grade V. The negro girls get higher averages than the white boys. By the Point Scale ages the gross percentages are the same, but the averages of the amounts vary by .1 year. The retardation of the negro children is less in percentage than that of the white in grades II and V, and less in amount in grade II.

Reckoned by Binet ages the percentage of retardation of the negro children is greater than that of the white children, though the average amount is the same for both. At 11 the negro percentage is a little less, and at 8 the two groups are about even. The percentage of retardation is greater for both groups by the Point Scale though the difference between them is about the same by the two scales, the negroes being the more retarded. The difference in amount is a little more than .1 year in favor of the white children. As to percentage of retardation at different age levels, that of the negroes is less at 8, 11, 12, 14 and 15, and the two groups are even at 13.

The differences between the boys and girls both white and black are somewhat variable. The white girls in every grade average higher according to both scales than do the boys. The same is in general true for the negro girls. In grade IV the latter rank lower than the boys according to the Binet Scale, and their amount of retardation increases in the higher grades more than it does in the case of the boys. The white girls surpass the boys in all their averages at every age according to the Point Scale scores and ages, but the average of their Binet ages is lower at 8, 9, and 12. The general averages of the negro girls according to chronological ages are higher than those of the negro boys, but the averages of their Point Scale scores and ages are lower at 9 and 14 and their Binet averages are lower at 9 and 13 than those of the negro boys. There is, consequently, some indication of a difference in mental development between boys and girls at the 8-9 year level and at early adolescence.

In order to compare racial and sex differences, the white children were grouped into a lowest 25%, a highest 25% and the medium 50% according to their scores by the two scales, and the percentage of negro children between the same

limits was found. The percentage of negro children in the lowest group is greater than that of the white, but also the percentage in the highest group. According to this grouping the sex difference between the white boys and the white girls, and between the negro boys and the negro girls is greater according to per cents of the Point Scale scores than the corresponding race differences, but according to the Binet ages and the Point Scale ages, the race differences in the two highest groups are greater than the sex differences. If these children are compared as to amount of their scores according to the different scales the sex differences between the white children according to Point Scale ages are greater than race differences at chronological ages 10, 11, 12, and 13, and similarly the sex differences of the negro children at 8, 9, 10, 11 and 12. According to Point Scale scores the sex differences of the white boys and girls are greater than race differences only at 13, but the sex differences of the negro at 8, 9, 11 and 12. Only at 10 and 13 according to the Binet ages do the white boys differ more from the girls than each sex does from the corresponding negro boys or girls, and the negro boys and girls at 11 and 12 differ more widely from each other than they do from the white children, that is, the racial differences in amount of Binet scores are greater than the difference between the boys and girls of each race. These comparisons show the great variability of racial and sex differences at the different age levels, and also that the amount of this variability depends on the scale used. On the whole, the negro boys and girls differ more from each other than do the white boys and girls, and the scores seeem to indicate some definite racial differences, which become more apparent when the rating of the children in each test is considered.

According to the Point Scale the negro children are inferior to the white in exercises 3, 5, 8, 11, 15, and 20, though the averages conceal the fact that the negro boys do slightly better than the white boys in tests 5 and 8. The same facts are brought out by the Binet Scale only in part, as the scores show the negro children inferior in tests V. 1, XII. 4, and VIII. 2, equal to the white children in tests IV. 4, and IX. 5, and decidedly superior in test X. 4. The differences between the children and divergences of the scores according to the two scales are both significant. Their rating in Point Scale 3 and Binet XII. 4 and IV. 4, shows that the negro children can distinguish the longer and shorter of pairs of lines as accurately as the white children, but when the six pairs of lines are arranged so as to test suggestibility they will yield to the suggestion much more readily. In the test of arranging weights (Point Scale 8,

Binet IX. 5) the scores of the white children are higher according to the Point Scale but equal to those of the negro children by the Binet Scale, a variance that shows a preponderance of higher scores on the part of the former. As this exercise tests motor adaptation and accuracy of judgment in manipulating things, the negro boys and giris may be inferior in both. So far the investigation has disclosed no definite difference between the two groups in methods of handling the weights, so that it seems that the lower scores are due chiefly to deficiency in accurate motor discrimination. In the comprehension test, the negro children do better than the white according to Binet scoring (X. 4) but less well according to the Point Scale (15), due to the greater frequency of the less comprehensive and intelligent answers. The examiner received the impression from these answers of the negro children that kindness and forgiveness and the avoidance of bad words had been drilled into them as general principles, so that they replied as they felt they "ought" rather than as they would act. Such an attitude was not prominent among the white children except in a few special instances and in the problem of action versus words. In the white school the use of offensive language had to be strenuously discouraged. Hence judging character by the language used loomed large before the white children as well as the negro children. Both groups of children did poorly in completing the analogies (Point Scale 20). From the white children 61 correct answers were obtained for one analogy (almost invariably a), 26 correct answers for two analogies, six for three and three for four analogies. The corresponding results for the negro children were 58, 17, 12 and 5, or 54% of the white children were able to give 1 correct answer, 23% gave 2 correct answers, 5% gave 3 correct answers and 2.5% gave 4 correct, as compared with 46%, 12.5%, 10% and 4% for the negro children between 8 and 15 years of age. Perhaps such results indicate slightly less general intelligence on the part of the younger negro children than the white. Four correct replies were given by 2 thirteen-year-old white girls, and 1 fifteen-year-old boy, and in the case of the negro children by an eleven-year-old girl, 2 girls and 1 boy fourteen years of age, and by a fifteen-year-old girl. Analogy (a) proved to be the easiest and (e) the most difficult.

In memory tests, according to the Binet Scale, the white boys do best in VIII. 5 (repeating 5 digits), and the white girls in IX. 3 (giving date); the negro children a little better in the other tests except VIII. 3 (giving days of week) in which both groups get the same averages. The general aver-

ages according to the Yerkes Point Scale are a little higher for the negro than for the white children, but as in the case of the Binet Scale the scores for the different age levels are very variable. The negro children average higher in the tests requiring immediate retention of words than in retaining numerals. Their scores for memory span of digits (Point Scale 4) show fewer scores of 5 both relatively and absolutely than do those of the white children, but they have more scores of 4 in this test.

On the other hand, the negro children do better than the white children in describing and interpreting pictures, in giving words for three minutes, in constructing and re-constructing sentences and in defining abstract terms. How much better many of the negro children succeed in describing pictures and in giving words for three minutes is not brought out clearly in the scores. They described the pictures with greater detail and understanding than the white children, so that it was often difficult to decide between description and interpretation, and in such cases the error in marking tends toward a lower rather than a higher scoring, in order to avoid giving undue credit to ease in use of words and to imaginative responses without the deeper comprehension. The free-association test called forth a much greater number and variety of words among the negro than among the white children. The latter in the majority of cases confined themselves to objects in the room or immediate surroundings, the former drew freely from all sorts of experiences. The other tests in which they do better also involve the use of words, or the appreciation of form as in drawing a square, a diamond, and designs from memory. This group of negro children, then, do worse than the white children in work that demands finer sensory discrimination and resistance to immediate impression such as the tests in estimating lines and weights, and in some forms of reasoning, but they do better in tests demanding verbal analysis and facility and constructive imagination.

There are some tests in which the negro boys do better than the white boys, but the negro girls worse than the white girls, namely, in tests 5, 9, 10, 17, 19 of the Yerkes Scale. The averages for these tests show that the girls and boys of each race are very nearly alike, the averages being somewhat in favor of the girls both white and negro. Thus the apparent anomaly must be due to the mental superiority of some of the white girls. The scores of the boys as distinct from those of the girls in the Binet tests show few differences of any considerable amount. The white girls do better than the boys

in defining concrete and abstract words, giving date and naming months and the boys do better in the game of patience, in repeating numerals and drawing designs from memory, which results perhaps indicate better permanent retention of details on the part of these girls and better immediate discrimination and memory on the part of these white boys. The negro girls surpass the negro boys in arranging weights and constructing sentences and the boys in the game of patience, copying the diamond, drawing designs from memory and counting stamps. Thus these negro girls do better in kinaesthetic discrimination and verbal analysis and the boys in visual discrimination and motor co-ordination.

Some interesting facts result from a study of the scores of the white and the negro children in the tests used by Binet and which were not adopted by Yerkes. In test V.5, the negro children made many more failures than the white children, and the girls are worse than the boys. When this test was given the number of moves made by each child was recorded. The white girls who succeeded in the test averaged 5 moves, the successful boys 3 moves, while those who failed averaged 10 moves for the boys and 11 for the girls. The successful negro children made an average of 3 moves each; the unsuccessful boys averaged 6.5 moves each and the girls 5. In this test the individual negro was not slower than the white child, but as many more failed, their average reaction time is higher than that of the white. No negro child made as many attempts as some of the white children. Several of the children both white and black arranged the triangles correctly but did not notice it, and continued trying different arrangements. All the white boys who failed were over 3 years retarded except one boy, almost 3 years retarded, who made 24 attempts. The white girls who failed were about evenly divided between the worst and the best according to their scale scores. The negro children showed a similar tendency, though a few boys with comparatively high mental age averages failed. One 11 year old negro boy about 2 years retarded made 22 moves, the largest number. Some of the most retarded children, both white and black, were satisfied with an incorrect arrangement of the triangles.

In the Binet tests of executing three commissions, distinguishing between right and left and recognizing all the pieces of money, the black and white children are about even, but in making change the negro children are inferior, but superior in naming the date and the months and giving rhymes. Not a single child solved completely the problem of reversing the clock hands, though a small number, about the same per-

centage of each race, gave correct answer to half of the test. The difficulty may have been not so much lack of ability to control visual imagery as lack of acquaintance with timepieces. This test and the problem questions were the most unsatisfactory tests for these children. One negro girl alone gave the answer required by Binet for the first problem, but 4 white boys and 1 girl suggested a corpse or a man hanging. All of these children readily gave answers to (b) such as sickness, death, fighting and killing, but few gave a complete explanation for the presence of the three officials, and these few failed in problem (a). To the latter problem the answers of the negro children were more varied and specific, and fewer of them answered leaf, moss, or branch than did the white children. The negro children, both boys and girls, did a little better with the code test than the white children.

The designs drawn from memory were often extremely fanciful, many queer additions or changes being made, so that the copies were entirely different from the originals. No difference in difficulty between the two designs could be inferred from the results. Here the white children seemed to draw as freely on their imagination as the negro, as they contributed 28 and the negro 25 of these peculiar drawings. These designs were about evenly divided among the white boys and girls as well as among the more and the less retarded. As regards the negro children, all the most retarded of those above 12 years of age, and almost the same number of the more and the less retarded among the younger children produced some bizarre designs.

In connection with the Binet tests the scores for opposites were obtained for the negro children. When the white children were tested 3 failures were deemed sufficient to make further work with that test unnecessary, except with the fifth grade children who were given the test in full. All of the negro children were given all 20 words, no matter how many failures or mistakes were made. Thus a complete comparison between the two groups is not possible. As far as they are comparable, the negro boys do better at every age than the white boys, while the white girls are superior to the negro girls only at 11 and 13. The white children are below Pyle's norms except the 11 year-old white girls. The negro boys are below these norms except at the ages of 9, and 10, and the negro girls also except at the ages of 8, 9, and 10. The scores are probably not fairly comparable with Pyle's norms as the tests were administered differently, but the scores seem at least to indicate that these children are inferior to the children tested by Pyle. On the whole, the Opposites test also

appears to be one involving the use of words in which this group of negro children is superior to the white children tested.

In addition to the individual testing of each child by means of the Binet and the Point Scales, three different class tests were given under the direction and supervision of the investigator. As these tests involved reading and giving of directions that had to be comprehended by the whole room full of children, it seemed better that the class-room teacher do the actual talking in order to avoid any possible misunderstanding from a difference in pronounciation.

The first of these tests was the so-called logical memory test, The Marble Statue. The story was read to the children and they reproduced it, being given all necessary time for writing what they recalled. The directions given by Pyle[2] were followed exactly and the results compared with his norms. According to the averages in this test, the negro children seemed on the whole inferior to the white, whether classified according to sex, age or grade, with the exception of the fourth grade, where the white boys had lower scores than the negroes. The same inference must be made from a comparison of these scores with Pyle's norms. Though the white children in general average below these norms, the negro children are still lower as can be seen from the average deviations, —.49 for white boys, —.61 for white girls, as compared with — 1.04 and — 1.45 for the negro boys and girls respectively. If five records which are less than half the average scores and which are made by retarded children are excluded, the average deviation from Pyle's norms will be — .36 for 41 white boys, — .7 for 41 negro boys and — 1.22 for 28 negro girls, while the white girls exceed Pyle's average by .18.

As the reproduction of this story may be to a great extent verbatim repetition and at the best is a measure of the ability to retain and organize ideas logically, it seemed that interesting differences might be brought out by giving the children an opportunity to let their fancies roam freely. The beginning of the story suggested by G. M. Stratton in the "Atlantic Monthly" February, 1916, p. 212 in his article, "Girls, Boys and Story-Telling," was used. This was read to the children by the teachers who asked their pupils to finish it as well as they could. The compositions resulting have been entitled "The Princess" and marked according to the number of ideas added by the children to complete the story. The superiority of the negro children of corresponding grades

[2] Pyle, W. H.: Examination of School Children, pp. 9-10.

and ages over the white children is almost startling. The general average for the white boys is 3.4 (M. V., 1.3), for the white girls 4.8 (M. V., 2.2), for the negro boys 10.8 (M. V., 3.9) or 12 if two greatly retarded boys are disregarded, and for the negro girls 12.6 (M. V., 3.4) while only one white girl surpasses the average of the negro girls and not a single white boy reaches the average of the negro boys. The fifth grade average for the white children is 5 as against 11.3 for the negro. The fact that the negro children are somewhat older cannot be the sole explanation of this difference, as both white and negro boys do best at 11 and the girls at 13.

The correlation between the Marble Statue and the Princess gives the following coefficients: For the white boys grade III., r = .22, grade IV., r = .32, grade V., r = .48; and for the girls grade III., r = .37, grade IV., r = .01, grade V., r = —.42 For the negro children the coefficients are for the V., grade boys — .38, and for the girls r = 0, for the VI. and VII. grade boys r = —1., and for the girls — .94, and for both boys and girls r = — .96. These divergences in correlation suggest some difference in the mental processes of these children when confronted with such a test as completing a story. For most of the white children it is apparently a matter-of-fact task, a perfunctory duty; for many of the negro children it becomes a delightful chance to call forth memories and fancies, though the former have much better opportunity to see pictures and read stories.

Color preferences of negroes are often supposed to be distinctly different from those of white people. In order to investigate this assumed difference and also to test their aesthetic judgment in this field, each child was given the box of eight colored crayons used in their drawing work and outlines on rag-paper of a little girl holding over her shoulders a long cloak or train which falls on the floor behind her. Although such a figure would be familiar to all, it also would be out of the ordinary so as to stimulate inventiveness. Recollections of carnival costumes might also show their influence.

Classifying these colored drawings first by the color of the dress, as being the most prominent feature, we find that of 78 negro children the boys show a decided preference for blue with yellow a distinct second, while the girls also put blue first with orange a much closer second. No boy chose green for the dress while among the girls green and red tied for the fourth place. For the color of the cloak, the negro boys make red first, orange second choice; the girls blue first choice, yellow second, and red a close third. The white boys select

blue and red as first and second choice for the dress; the girls show a decided liking for red, while blue is second in rank. No definite preference is shown for any one color in the cloak; the boys choose red and yellow, and the girls yellow and blue most frequently.

The color used most often by both white and negro children is black. The order of frequency for the white children, black, yellow, red, brown, blue, orange, green, purple, as compared with that of the negro children, black, yellow, brown, orange, red, blue, green, purple, shows that red is chosen more often by the white than by the negro, by boys rather than by girls, and that green and purple are at the end of the scale of preference, while orange stands much higher among the negro than among the white children. Thus the liking for bright colors seems in this case to be no stronger among the negro than among the white children. It is also surprising that the children often used faint colors rather than the stronger hues, and that the negro children especially combined a faint and a heavy tone of the same color. It may be of interest to note that the order of preference for the color of the hair is for the white children, black, brown, yellow; for the negro, brown, yellow, black. Some college girls in the Art Department who colored the same drawings chose blue, orange, green and yellow, or combinations of these for the dress, did not use black at all, and made the hair yellow or auburn.

The colored drawings of these 167 children were submitted to two art teachers for judgment and classified as excellent, good and poor. One of them judged the drawings just as similar work of college art students would be estimated, according to accuracy and correct relations of color values, the other placed more stress on color tones and inventiveness. The former will be termed the A, the latter the B classification. According to the A judgments 9% of the colored drawings of the white children were excellent, 29% good and 61% poor, and only 18% of those of the negro children were good and the rest poor. According to the B verdict, 17% of the work of the white children was excellent, 44% good, and 39% poor, as compared with 23%, 33% and 43% for the negro children. In the case of the latter the B judgments place the majority of the children whose chronological ages, Binet mental ages, and Yerkes Point scores are highest among those who do best in coloring, while the A judgments class the children whose scores are medium as good in coloring the outlines. For the white children the two sets of judgments agree much better as to chronological age and Binet standing, but show some divergence in relation to the Yerkes scores, more of those whose scores fall between 40 and 60

being considered good by B than by A. Fewer of the children, both white and negro, of the upper grades are put in the poor class by B than by A. It seems from these facts that the use of colors by the negro children is more primitive, but also capable of development along new lines. To the investigator the poorer work of the two groups seems very similar, though none of that done by the negro children is quite so crude as that done by a few of the white girls and boys, while the better work shows more daring and striking combinations than any tried by the white children.

More of the colored drawings of the white boys than of the girls were judged excellent by both A and B, though a greater number of girls than of boys were put in the "good" class by B. The work of the girls was considered decidedly poorer by A, 54% of the boys as against 72% of the girls being put in the lowest class, while in the B list 40% of each sex are found in the poor class. The negro girls were considered somewhat better than the boys by A (21% as against 15%) while a greater number of boys than of girls were put in the "excellent" and "good" group by B.

An attempt was made to correlate this work in coloring with the story of "The Princess". Here the B judgments show somewhat better postive correlations with the story than do the A judgments as regards negro girls, while in the case of the negro boys, the A judgments are in inverse correlation with the upper 50% and very close correlation with the lower 50%, while the B judgments sustain exactly the opposite relations. Too few subjects were tested to draw any conclusion.

A comparison of these results with the findings of other investigations shows both similarities and differences. The conclusion drawn by A. C. Strong[3] that "colored children are mentally younger than the white children of corresponding ages" is true of these children also if measured by the Binet Scale, but not according to the Point Scale. That "the colored children test more irregularly than the white children" is partly corroborated by this investigation, but the conclusion that "according to the Binet Scale a larger number of white children are in a grade below their mental ability rather than above, and the reverse is true of the colored children" does not hold of these children. As to the difficulty of individual Binet tests the results are in harmony as regards the difficulty of IX. 2 and 5, X. 2 and 4, XI. 5 and XII. 3, 4, 5, and the ease of VIII. 1, 3, and 5, and X. 1. But VIII. 4 and X. 5 proved harder for the white children than for the negro, and

[3] Strong, A. C.: Three hundred and fifty white and colored children tested by the Binet Scale. *Ped. Sem.*, 1913, 20:485-515.

XII. 1 and 2 hard for both. Not any child examined gave both answers required by Binet for XII. 5, though some reasonable answers were given by both groups.

The observation of Phillips[4] that "the colored pupils as a class were good in the memory tests and poor in those requiring judgments" coincides only in part with the results of these tests. That they "were generally slower in response" was true as regards some of those who were more retarded, but not of the group as a whole. In fact their reaction time seemed less in exercises that test verbal associations and analysis. Mr. Phillips found the negro children "less animated." No such difference could be noted between these children.

The results of the measurements of these two New Orleans groups are in substantial agreement with those of Miss Perring[5] that the negro children on the whole are older and have apparently fewer physical defects than the white children, and that they are more retarded, only the retardation is greater in amount in the case of these children than was found in the Philadelphia School.

As the tests reported by Ferguson[6] were entirely different from those tried on the New Orleans children no comparison is possible. As regards the variance in ability between the full-blood and mixed-blood, the writer ventures no conclusion, as too few of the former were tested.

As far as comparable, the results of this investigation agree on the whole with those reported by Pyle[7]: that the racial differences are variable, that the negro girls surpass the boys more than the white girls surpass the white boys (if the averages alone are considered), and that negro children are inferior in motor-co-ordination.

Summary

1. Specific differences between these white children and negro children seem to be mainly a greater facility in control of words, a more fertile imagination as relating to general human activities, though not in problems demanding mechanical preciseness and ingenuity, and a more original and perhaps more primitive taste in use of colors, on the part of the latter;

[4] Phillips, B. A.: The Binet Tests Applied to Colored Children. *Psychol. Clinic*, 1914, 8: 190-196.

[5] Perring, L. F.: A Study of Comparative Retardation. *Psychol. Clinic*, 1915, 9: 87-93.

[6] Ferguson, G. O., Jr.: Psychology of the Negro. *Archiv. of Psychol.*, No. 36, 1916. pp. 138.

[7] Pyle, W. H.: The Mind of the Negro Child. *School and Society*, 1915, 1: 357-360.

greater resistance to suggestion, better kinaesthetic discrimniation and motor control, and perhaps a better capacity for logical analysis on the part of the white children. The tests in reasoning on the whole show no definite race differences. Contrary to a prevalent notion, these negro children were not superior to the white in verbatim reproduction or immediate retention, and about equal to them in tests of permanent retention. A greater variety of details was noted by the negro children in the Binet pictures, so that in this respect their capacity for observation is keen. In work requiring constructive imagination, as shown in story telling, they were far superior to the white children tested. The test used to get a clue to differences in color preferences did not show a more decided choice of the brighter and more saturated colors by the negro than by the white children. The variance in reaction of the white and of the negro children to the test in finding rhymes made this also one of the more significant exercises, as complete failure in giving rhymes was very rare among the black, but rather frequent among the white children.

2. The variability of the scores of these children may be due to race differences, sex differences, or variations in individual capacities. If all the results are considered, the influence of the latter factor is probably as great as either of the others.

3. The educational bearings of the results of these tests may be significant if corroborated by more extensive investigations. They indicate on the part of the greater number of these negro children a keener sense of rhyme, an unusual facility in story-telling and originality in color combinations. For example, in their stories suggested by the Binet pictures and their compositions on "The Princess" many of them showed an artistic development very different from any manifested by the white children. On the other hand, in exercises that test abilities most commonly demanded in our public schools, the majority of the black children reach the average of white children markedly retarded both according to school grades and mental tests, though some of them exceed it. But if there are certain traits in which they differ conspicuously from the white children it would seem advisable to encourage and train these peculiar tendencies as well as more general capacities instead of exclusively trying to fit them into the pattern that suits a majority of the white children. Educational progress may be achieved both by conforming to high standards and by individual variations.

SIDETRACKING OF STUTTERING BY "STARTERS"

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The object of this paper is to collect from patients methods and means used by stutterers to start their own speech.

The so-called "starter" is not a symptom or sign of stuttering. It is not always present in uniform shape; but varies according to the ingenuity of the patient and according to the methods he happened to stumble upon. As it is not a symptom or part of the disease itself, a definition is therefore apropos under such circumstances.

A "starter" consists in any sort of a makeshift, start, action or attitude that a stutterer consciously or unconsciously invents in order to facilitate the flow of language. More detail can hardly be taken without encroaching upon the main part of the paper. Perhaps one illustration will suffice to clarify this definition. For example, a stutterer comes to me and tries to say "Good-morning, Teacher," but the "g" sticks in his throat and he is unable to utter it till he moves both elbows outward. This he claims starts his speech somewhat better than without it. To the external observer he is able to utter the "g" in "good" and the word "teacher" runs off easily itself afterwards.

The patient has consciously invented this speech helper and consciously employs it to start his speech and finally it may become an unconscious motion.

A word about what the "starter" is not. The starter is not a cure. The starter is not something that has been told the patient by another; otherwise it would be a method of cure or at least a method of relief. Starters are not the same in their form. Finally they are not any part of the disease whatever. A starter is not tic; and not chorea.

With this, I think it will be clear just what a starter is and what it is not. Let us proceed then to describe what they stand for and do when used by patients.

The principle of starters is simple and always the same. The sole and only reason for employing a starter is for the obvious reason of diverting the attention from the throat contraction and throat spasm and the accompanying mental strain that prevents utterance.

We come next to the forms and varieties of "Starters." Out of our entire list of stuttering patients, 123 cases, we have tabulated the various forms and shapes of starters that were used by some of these patients. The varieties of starters consist of the following:

Of 123 patients
Of these
- 45 have starters.
- 1 was arm motion.
- 2 were leg motion.
- 1 was body motion.
- 9 were hand motion.
- 8 were head motion.
- 7 were parts of face.

A complete list of all these starters follows:

Taps with little finger and bobs head up and down.
Occasional repetition of syllables.
Speech accompanied by excessively stiff and open jaws.
Frequent inhalations.
Deep inhalations.
Laugh.
The word "For."
Marked contortions consisting of throwing the head to one side with strained and forced open mouth, contraction of neck muscles which spread to the back, arms and sometimes legs; also frequently long closing of eyes.
Speaks slowly and clasps hands.
Hand and leg motion.
Whisper.
Click of the tongue.
Laughs, blows and wobbles her head about; also says, "Let me see."
Raises leg or arm.
Closing fist and moving hand as in pounding.
Says a short sentence three or four times under his breath.
Also repeats a vowel or consonant over five to six times, then utters his sentence.
Holds breath before starting a sentence and says, "See-see-see."
Rapidity in utterance 2 cases.
"Breathing and thinking ahead what he had to say."
Tapping and talking slowly, gasps and throws back his head with deep inspiration.
Bobs head up and down as if saying yes and no in rapid succession.
"S" as a starter.

Gasps frequent and severe.
Hard jerk and jaw drops.
" I wait and then I can say it."
Crossed fingers behind her back, flaps her hands to side; also stamps feet three or four times before beginning to talk.
Pounds hand or fist on knee, table or chair.
Twists or puckers her mouth.
Puts hands together and opens and closes them like a shell.
Breathing 2 cases.
Inhalation 3 cases.
High note as a starter; also repeats initial syllable. Sometimes strikes three or four high notes, going higher and higher till this works as a starter.
Helps himself by stopping and thinking.
Stops and starts all over again.
Movement of head to right and left.
Bows his head and holds it down and tries to blow out his words.
Moves her hands and sometimes takes a deep breath.
Holds mouth open in hesitation before speaking.
Motion of body.
Breathes to start his talk.

We come now to a consideration of the psychological analysis of some of these cases.

By this is meant an introspection of the patient himself before starting the starter, the effect of that starter, and the comparison of his speech with or without that " starter."

This can be shown by presentation of the following case analyzed in the way mentioned above.

That is, the psychological side can be easily seen by a report of some introspections by patients as follows:

Puts hands together and opens and closes the fingers like a shell.

The instant trouble is anticipated the patient tries for slowness of speech as a " starter " and secures it through the hand motion. The slowness partly diverts his attention, but it doesn't cure—that is, he has the same trouble the next time on the same word. Help is merely for that occasion.

Pounds knee, table or chair with fist.

The starter is used when the patient stutters very hard. Boy says, " When the stutter comes back " he applies the starter in the middle of a hard stutter. Boy says, " Helps to make stutter go away." Pounds with right hand mostly

but sometimes both together, to "make stutter stop." Patient can not introspect very well. He says the sentence goes along easily after "the hit." After stutter is relieved by activity, the following words are easier. After suggestion he says that he anticipates trouble and uses the "starter" to sidetrack the stutter, but usually uses it after the stutter has begun.

Twitch of mouth.

Pucker of mouth.

"Starter" consists of puckering her lips to help speech along. She uses it at the beginning of a stutter.

It is used pretty constantly, yet on some days when stutter is not so bad it is not used so much.

She sees trouble coming ahead on certain words. When the stutter is to be severe she uses the "starter," which is left out when little trouble is anticipated.

Help is momentary. Just as much trouble on same words next time.

To summarize these psychological activities, we would say that the data in these few cases of introspection show:

First: That "starters" originate as entirely conscious matters. After long use they may become almost unconscious but not quite so, although they are held to be so by the patient.

Second: That they are used just after trouble is anticipated and mostly when severe trouble is anticipated. In other words the patient sees trouble coming, then consciously inserts the "starter" to sidetrack it.

Third: "Starters" are entirely a matter of volition and may be inserted or omitted at the will of the patient.

We next come to the explanation of the inefficiency of starters. They fail to cure. They fail to relieve more than temporarily. They only relieve for the instant. It is up to us now to give the psychological reasons for this inefficiency.

The reason is because a "starter" is merely a temporary diversion of the attention.

Completion of the treatment of stuttering is made through and comes from the development of the visualization process.[1] A momentary sidetracking of the attention can hardly ever attain to the dignity of developing such processes whence comes its inefficiency as treatment.

Summary: To recapitulate, a "starter" consists in any invented motion or action gotten up by the patient to help his

[1] Swift, Walter B.: "The Developmental Psychology of Stuttering." *Journal of Abnormal Psychology*, Oct.-Nov., 1916.

speech action. From analyses these are shown to be movements of head, arms, body, face. To the variety of 41 in 45 cases out of 123 cases examined, they are merely instant helps. They are no cure. They are usually different in different patients. They are usually the same in the same patient. Their momentary efficiency consists merely in a diversion of the attention. Their failure to cure consists in the lack of any profound development of visualization processes.

BOOK REVIEWS

H. L. HOLLINGWORTH, *Vocational Psychology, Its Problems and Methods.* D. Appleton & Co., 1916, pp. xviii, 308.

As a result of the tremendous increase in industry and in the varieties of occupations during the nineteenth century, we at present must face the important problem of fitting the right man to the right occupation. This is obviously as important for the employed as it is for the employer. Some systematic and scientific attempts have been made to work out methods for indicating the aptitude of an individual for certain lines of endeavor. Such an attempt, the author points out, resolves itself essentially into a study of individual differences, differences largely in the mental characteristics of both the occupation and of the individual. Although this branch of applied psychology is still in its infancy, a sufficient body of carefully acquired facts has already been determined to warrant the designation of Vocational Psychology. Hollingworth frequently emphasizes the fact that this new science is still incomplete and that, at the present time, it is by no means capable of giving the proper vocational guidance to the individual case. The present volume is an attempt to determine definitely the problems which the new science must attempt to solve, to summarize the present existing methods and the body of fact already acquired, and finally to evaluate the methods and to point out which of them appear to be the more fruitful. Hence we have here an attempt to work out a systematic program for work in the future.

Hollingworth first discusses the historical background for the science of vocational psychology and in this connection he most severely criticizes the alleged science of physiognomy which has recently been revived. He points out that the true psychological test must be employed in such an analysis. We must first analyse all of the occupations,—obtain "Psycographs" of the different jobs, to use the author's term,—and determine the physical, physiological, intellectual, moral, social and temperamental characteristics necessary for each. We must then evolve tests to determine the presence of these same characteristics in the individual who presents himself for examination.

The author discusses the experiments which have been conducted in an effort to obtain a very careful, complete and detailed picture of the mental processes of men who have achieved marked success in their chosen professions. The case of Henri Poincaré, the eminent mathematician and philosopher, is given in great detail and the results indicate that this is a very fruitful line of investigation. This line of attack is important because "it is on some variation of this method that we must largely rely in our efforts to learn to what degree vocational success depends on the presence of demonstrable personal characteristics, rather than on the accidents of time, place and circumstance." It is hoped that eventually we may have such a series of vocational psychographs for all occupations.

Hollingworth considers next the question of specialized vocational tests and methods. There exist to-day "some twenty types of work for which tests have already been proposed, recommended and more or less tentatively tried out." These the author describes and he also

attempts to evaluate their worth. The self analysis of the individual is also discussed. In this connection, Hollingworth points out that the more complete this analysis, the greater its value. The lists of traits proposed by Cattell, Wells, Yerkes and LaRue and other workers in this field are given. The author also discusses the method of the judgments regarding an individual's traits of character as passed by his associates. An entire chapter is given up to the consideration of the correlations and evaluations of self analysis, the estimates of associates and the results of objective tests, in which connection Hollingworth reports the results of a new and carefully planned experiment along these lines. The school curriculum as a vocational test is treated in a separate chapter. In a sense the school curriculum may be conceived as constituting an elaborate mental test, inasmuch as it selects and classifies individuals who possess a certain type of mental alertness or patience. It also supplies the individual with certain subject matter which may be of use in after life and affords opportunity of exercising such specific or general abilities as the curriculum calls into play.

The book contains a gratifyingly large number of summaries of experimental studies in which the results are given in great detail. Also a classified bibliography and an appendix of tests and test-blanks are included, which should be of interest to both the technical reader and to the layman. The book is written in an easy non-technical style which is very readily understood. One is impressed by the conservatism shown by the author throughout the discussion and by the keen analysis and good common-sense displayed. A chapter on the vocational aptitudes of women by Leta Stetter Hollingworth is included in the text. This author fails to find any evidence existing at present which tends to show that women should be excluded from any of the occupations examined.

Clark University. SAMUEL W. FERNBERGER.

SIMON ROBERT HOOVER, *The Science and Art of Salesmanship*. The Macmillan Co., 1916. pp. xviii, 193.

This book is intended to serve as a textbook in commercial courses for beginners and for more or less experienced salesmen. The author holds that "salesmen are not such by birth," but that salesmanship is the "result of study and practice." A sale as a psychological process is analyzed into: involuntary attention, voluntary attention, interest, desire, determination or decision, and action. The last part of the second and the whole third chapter are devoted to the salesman's mental attitude. The author advocates not only that "kind of courtesy which will endure slights, and sometimes even insults, without retaliation" but also a courtesy which "must be the real article, not merely a Friar Tuck species of superficial veneer, which can be assumed in the presence of the prospect and discarded on leaving him." His exact meaning of the important terms employed is illustrated by concrete examples, given in an anecdotal fashion, and selected from the sphere of business-life. In his discussion of other requirements for successful salesmen he gives a similar treatment to such terms as poise, cheerfulness, faith, hope, enthusiasm, persistency, alertness, procrastination, initiative, concentration, temper, self-control, tact, diplomacy, patience, ambition, promptness, and dominance of expression. The customers or "prospects" are divided according to temperament into the vital, the motive, and the mental, and their respective characteristics are enumerated. According to motives they

are classified as cautious, stubborn, vain, conceited, argumentative, and cunning. The next three chapters deal with the process of the sale, the demonstration, and the closing of the sale and recommend many generalizations for the guidance of the salesman which are well illustrated. In the shortest chapter, less than five pages long, some of the most important suggestions are made on "finding and correcting mistakes." The remaining chapters deal with the "Relations between Departmental Managers and Salesmen," "Department Store Instructions," and "The Salesman's Reward," again each topic being amply illustrated.

While the general style and treatment of the subject seems to the reviewer well adapted to beginners he doubts whether older salesmen, especially if their reading is not supplemented by classroom discussions, will derive much benefit from it, particularly with regard to the psychological aspects of the topic. The crude and superficial analysis of the "prospect" is not suited to foster the right mental atittude in the young salesman toward his—shall we say: "victim." The enumerative serial of mental requirements for a good salesman is so disconnected and so superficially related to the general vocation that the young reader will either be overwhelmed by it and give up the attempt to attain it,—for it can be attained by "study and practice"—or else on account of its generality he will gain the conviction that he already possesses most if not all these requirements and therefore will consider further attempts to improve himself as a waste of time. In fact, the list fits any other vocation about as well. With the exception of the picture of the salesman's sample case the other four illustrations are of little instructive value. The whole book is a splendid evidence—if such is necessary—for the urgent need of a psychological analysis of the processes of selling. L. R. G.

JEAN WEIDENSALL, *The Mentality of the Criminal Woman.* Warwick and York, Inc., 1916. pp. xx, 332.

The subtitle "A Comparative Study of the Criminal Woman, the Working Girl, and the Efficient Working Woman in a Series of Mental and Physical Tests" indicates the general scope of the work which was conducted by the Department of Psychology in the Laboratory of Social Hygiene at Bedford Hills, New York Reformatory. The results obtained from 88 convicted women, 16-33 years old, at their first admission to the institute, are compared, step by step, with results from 515 girls 14-15 years old and ready to leave school who were tested by Dr. Helen T. Woolley and Mrs. Charlotte R. Fischer in the Bureau of Vocational Guidance connected with the public schools of Cincinnati, and in part also with similar data from 18 maids, 17-30 years old and working at Vassar College. All tests of the criminal women were given by the author, to one subject at a time, in a quiet and pleasant room, during the first two weeks of admission, while the subject was kept isolated from other inmates, and only if she was in a normal condition, "so that if they fall below the standard series (of school-girls), they do so with everything in their favor." Many other examinations and tests were made on these women, but only those are reported here which can be compared with other groups of subjects.

The results include the physical tests of standing and sitting height, weight, strength of grip for each hand with the Smedley dynamometer, steadiness of hand, and rapidity of the tapping movement during 30 and 60 seconds, as an index of fatiguability. The

following mental tests are reported: sorting of 48 cards each marked with a circle of a Hering color, cancellation of letter a, memory span for numbers and the per cent of seven, eight, and nine numbers remembered, substitution, completion of sentences, association by opposites, Woodworth and Wells' cancellation of numbers, facility and character of handwriting checked in terms of Ayers' and of Thorndike's scale and correlated with Binet age, rate and character of reading and number of ideas recalled, Woodworth and Wells' standardized easy and hard direction tests, two new verbal direction tests, ability to tell time, and several Healy-Fernald tests, besides mirror-drawing exercises. The second chapter gives a description of general methods, a classification of subjects for comparative purposes, and 27 pages of original scores made by the 88 Bedford women and the 18 college maids. In the third chapter we find a detailed description of each test as administered, the material and apparatus used in it, the instructions given to the subjects, comparative tables and graphs, and a discussion of the individual results. The comparative tables show for each group of subjects the 25th percentile, the median, the 75th percentile, the differences between the two percentiles and the median, and the upper and lower limits of the scores. In the fourth chapter other tests are reported on, in which 200 Bedford women were examined, including the 88, to make sure that the latter are truly representative of the general type of criminal women admitted to the reformatory, and to compare them in part with the 18 college maids and in part with the 200 Binet subjects. The next chapter presents the social, industrial, and physical records of the 88 women and the 18 college maids, and summarizes them in twelve tables. The last chapter, entitled "Summary and Conclusions" offers six more tables of results, bringing the total up to 94 tables, and one more frequency graph, bringing this total up to 95 curves.

All the tests give "evidence that the reformatory inmates constitute two pretty distinct groups with respect to their intelligence; . . . one group of the Bedford 88 has clustered about the better end of the standard curve, and another group toward the poorer end," the reason being difficult to discover. The only uniform factor separating the two groups seems to have been the amount of progress made in school, the poorer group showing much more retardation in school than the better group. The age of the women seems to have made no difference in the results. On the whole, the great difference in mentality between the 88 Bedford women and the 500 Cincinnati school girls seems to be, not an inability to perform tests, but a mental sluggishness in adaptation to new conditions, a carelessness, indifference, and irresponsibility, fostered, perhaps, by long habits of trying to do work without having fully understood what they are asked to do. "Another result of their habit of not thinking about what they are doing or about what they wish to accomplish is to make them more clumsy in their methods of work than such a group as the (college) maids or than they themselves actually need to be."

But this important result seems to the reviewer to be obtained mostly as a bi-product of the careful observation of the subject's behavior during, and attitude toward, the tests: the elaborate tests themselves and the still more elaborate methods of scoring and computing have only hinted at it. The author says "the fact that in many of the foregoing tests these women vary less from the normal in accuracy of performance than in rate of performance is not without its educational significance;" the reviewer wishes to point

out its further significance for the need of a future revision of the present methods of mental testing. Other important deductions as to the mentality of these criminal women are likewise not based on the tests themselves, but on certain other observations for which they incidentally furnished a good opportunity. The implicit criticism of mental tests is thus an appreciable, though not intentional addition to the great value of the work of the Bedford Laboratory.

L. R. G.

FRED CARLETON AYER, *The Psychology of Drawing*. Warwick and York, Inc., 1916. pp. ix, 186.

The general setting and scope of the problem, which is outlined in the first chapter, is the study of drawing and its value in laboratory exercises as a part of teaching the sciences in high-schools and colleges. The second part, chapters two to five, presents a condensed survey of the literature of drawing, discussing the chief contributions from the standpoint of methods of research, relation of drawing to intellectual development and analysis of the drawing products and of the drawing process. This is supplemented by an extensive bibliography of 110 titles, in which the chief points of interest and value of the special works on drawing are briefly indicated. In the third part the author's original investigation is described.

In this part the laboratory procedure in general science is subdivided into: 1. analytical observation with (a) representative drawing, (b) description, and (c) analytical or schematic drawing; 2. laboratory records of 1. (a), (b) and (c); and 3. retention and recall. The author's special problem is "to determine the character of the various interrelations of (these) factors." In the first experiment 51 first year high-school students in a general science class were directed to (a) make a representative drawing (or copy) of a turkey feather in 13 minutes; (b) describe and explain the same object (12 min.); (c) study two groups of details of it according to directions and answer one question each about them (10 min. each); (d) dissect a certain part, observe it under the miscroscope, and answer a question about it (15 min.); and (e) make a diagram showing relative arrangement of observed parts (15 min.). The next step in the experiment consisted in calculating the correlation between school drawing and achievement in other school subjects in the case of 141 normal school students. In the third experiment the same 51 high-school students were directed, 24 hours after the first experiment, (a) "to make a simple diagram of a feather, showing and labeling the parts visible to the naked eye" and (b) to answer certain questions about the object. Two groups of 30 and 31 undergraduates were then asked to observe and draw, first one, then another unfamiliar object, and five days later were given an unannounced examination to test their retention of form and color. A group of 48 graduate students, "immediately after spending seven minutes each in describing and drawing a microscope clip" were asked to give careful introspections about their procedure, according to certain directions. Finally, a class of 16 graduates was divided into two equal groups both observing at separate times the same object (a stuffed bird) and answering the same questions about it; but the first group was then directed to note carefully one particular detail, the second group, a different detail, and afterwards both had to "draw the bird in any convenient position."

The results of all these experiments were carefully scored and the correlations determined by the Pearson formula as well as by the Rank-Difference Method. Among the final conclusions, as stated in chapter 7, the psychological analysis of drawing, while most interesting, cannot be summarized here. Another important result is that "representative drawings do *not* afford a measure of the pupil's progress or an adequate record of the work which he has accomplished," they do *not* aid the memory, but interfere with the formation of scientific concepts. Verbal descriptions and analytical drawings are, however, very useful for these purposes, while memory drawings test retention of spatial and form relationships and call attention to previous omissions and errors. L. R. G.

E. L. THORNDIKE, W. A. MCCALL, and J. C. CHAPMAN. *Ventilation in Relation to Mental Work.* Teachers College, Columbia University Contributions to Education, No. 78, 1916, pp. 83.

This monograph contains a brief "Introduction" by Thorndike, an experiment by Chapman on the effects of the conditions of the air on mental work, the conditions being changed daily, and several experimental studies by Thorndike and McCall on the effect of certain conditions of the air upon (1) the rate of improvement of mental functions, (2) the accuracy of judgment, and (3) the choice of alternatives to mental work. All these experiments were "carried on under the auspices of the New York State Commission on Ventilation with the aid of a fund given by Mrs. Elizabeth Milbank Anderson." Only the psychological results are presented; "the chief aims were to measure the effect of heat and expired air upon the quantity and quality of the mental products produced per unit of time, and upon the readiness of individuals to work. Certain statements made by them as to their felt fitness for work and general well-being" are also included. The conditions of the air investigated were: as to temperature, variations of 86°, 75°, and 68° F., as to relative humidity, variations between 80 and 50%, as to movements of air, either almost none or stale air recirculated by four fans at high speed, and as to air supply, either none or 45 cu. ft. per minute per person of outside air. Many precautions were taken to control such variables as practice, fatigue, clothing, etc. The mental work included: color naming, cancellation of 2's and 3's, hard opposites, addition, mental multiplication, typewriting, and evaluations of specimens of handwriting and English composition. The subjects, mostly male university students, were tested in squads of four or five, remaining in some cases four, in others 8, hours, in the test-room. Under certain conditions they worked twice in the same half day for 75 minutes at a time, with a 30 minutes' interval; under other conditions they worked for two hours in succession both in the fore- and afternoon, and in a third set they alternated at short intervals between "maximal effort tests in which the subject is required to do his very best, and * * * option tests in which the subject is requested to do as much or as little as he pleases." Some of the options were mental multiplication of a three-place number, reading a current novel, resting quietly, sleep, conversation, and doing nothing.

The results are best stated in Thorndike's words, taken from his final section, "Summary and Interpretation," where he says: "With the forms of work and lengths of period used, we find that when an individual is urged to do his best he does as much, and does it as well, and improves as rapidly, in a hot, humid, stale, and stagnant air con-

dition * * *as in an optimum condition. * * * We find further that when an individual is given work to do that is of no interest or value to him and is deprived even of means of telling how well he does it, and is in other ways tempted to relax standards and do work of poor quality, he still shows no inferiority in the quality of the product produced in stagnant air. * * * Finally, we find that when an individual is left to his (or her) own choice as to whether he shall do mental work or read stories, rest, talk, or sleep, he does as much work per hour when the temperature is 75° as when it is 68°."

In his efforts to reconcile these results with the contrary experiences of daily life, Thorndike suggests that "the discomforts to which men have responded by ceasing mental work might perhaps better be responded to by working to pay for an electric fan, taking cool baths, or thinking out ways to reduce the physical exertions which accentuate the discomforts." He might have added the frequent observation that the *busy* person feels the unfavorable air conditions usually *less* than the *idle* one. His final word is "when heat reduces mental work it may do so *via* the general discomforts which it causes rather than by any intrinsic disability or unreadiness in the process of mental production itself." In an Appendix the instructions to the subjects for the tests employed are given in detail.

This monograph is by far the most important and valuable contribution to "bionomic" psychology that has appeared in recent times, and it is hoped that its author may find further means to extend it so as to investigate conditions for longer periods of work and to analyze in greater detail the mental states of the subject's comfort or discomfort, for in this point seems to lie the great psychological significance of work under unfavorable conditions of the air.

L. R. G.

BOOK NOTICES

GEO. R. EASTMAN. *Psychology of salesmanship.* Dayton, Ohio, Service Pub. Co. (c. 1916.) 267 p.

GEO. R. EASTMAN. *Psychology for business efficiency.* Dayton, Ohio, Service Pub. Co. (c. 1916.) 265 p.

In the introduction of the first book the problems in general are discussed. Part one takes up the making of the sale, including the training of the salesman, parts of the selling process, the pre-approach, aspects of solicitation, dealing with objections, marking down, etc. Part two takes up the process of thinking, feeling and acting, and here the psychology comes in. We are told many remarkable things concerning behavior, experimental psychology, mind, brain, habit, memory, learning process, instinct and attention, will, thinking, judgment, reason, etc. This is the weakest part of the book, and the topics are treated in the most schematic way. The third part, however, is not much better from a psychological point of view. It deals with factors which determine thinking, feeling and acting, such as instinct, will to live, interests, desire, value, price, truth, etc. We are told that this book is intended for those who believe salesmanship an honorable profession rendering an important and difficult service, and who believe that the salesman is not born ready-made.

In the second book the author first proves that business is connected with psychology, then expounds the process of thinking, feeling and acting. In an introduction he tells us about mental and physical processes, subject and object, mind and matter, knowledge of others, etc., and then discusses conscious purpose, association of mental processes, memory, reason, interest, attention, will, thinking, reflex arc, will to live, man as a social being, complication of interests, suggestion, hypnotism, belief and truth, etc. There is not much indication that this author has thought or even read very deeply in psychology. Perhaps the conning of this book might do good to those who know little or nothing of the subject, but the value of such works as the above seem to the writer of this note rather questionable.

The following books and monographs have been received:

LEWIS M. TERMAN. *The Measurement of Intelligence.* Houghton Mifflin Company, 1916.

J. E. WALLACE WALLIN. *Experimental Oral Euthenics.* Reprinted from *Dental Cosmos,* April and May, 1912.

—— ——. *Psychological Aspects of the Problem of Atmospheric Smoke Pollution.* Pittsburgh, 1913.

—— ——. *Psycho-Motor Norms for Practical Diagnosis. Psychological Review Monograph Series,* Vol. 22, No. 2, August, 1916.

—— ——. *Missouri Children's Code Commission.* December, 1916.

SIGMUND FREUD. *The History of the Psychoanalytic Movement.* Translated by A. A. Brill. Nervous and Mental Disease Monograph Series, No. 25. New York, 1916.

GEORGE D. HALSEY. *Self-Analysis in the Choice of a Vocation* and *Outline of the "Average Opinion" Plan.* Vocational Bureau, Chamber of Commerce, Atlanta, Ga., 1916.

The American Journal of Sociology. January, 1915.

Kentucky High School Quarterly. January, 1917.

NOTES

The Economic Psychology Association held its second annual meeting on January 26 and 27 in the Psychological Laboratory of Columbia University. The chief problems with which nearly all the papers dealt, either directly or indirectly, were the selecting, the training, and the retaining of employees. Most of the speakers were practical business men who have to face these problems in managing the affairs of their business; and it was instructive to learn what is the attitude of these business men toward the contributions which psychology has made to this subject. Psychologists are, as a rule, rather modest as to the practical value of their work; and there seems to be no immediate danger that their results will be mastered and applied by the business world, if one may infer from such progressive business men as constituted the New York gathering. Although business is calling loudly for help from psychology, the business man is either not ready to go half way and find out what psychology already has to offer, or else he demands quicker methods and "quicker returns" than science can promise. There seems to be a similar attitude in the industrial world toward medical contributions, as one of the speakers pointed out. Psychologists will be surprised to learn that department stores are still waiting for an adequate means of testing color vision, suggestibility, etc. There is clearly a lack of coöperation between psychologists and business men; the Economic Psychology Association aims to remedy this defect, and at the same time to serve as a clearing-house for the exchange of such practical devices as their various members have found to be valuable in their work. While a great deal of good might be accomplished by such an organization, it would seem that the present mode of handling the affairs of this particular Association is not well adapted to its purposes. With the exception of a few psychologists who were conspicuous by their silence, most members of the audience had evidently come to be heard rather than to listen. There is a danger that these meetings may be made a subtle means for promoting business schemes, just as laboratories of industrial research are sometimes regarded rather as a subtle means of advertising than as institutions for research. At any rate, secrecy for the sake of selfish advancement will never attract the hearty coöperation of scientists. Not until business firms are willing to come into closer contact with psychology will they be able to profit from the results which have been yielded by psychological investigation.

L. R. G.

From the San Francisco *Bulletin*, Jan. 18, 1917, we quote the following lines concerning the plans and work of Dr. Lillien J. Martin, former professor of psychology at the Leland Stanford, Jr. University: "She was making an interesting experiment. She was going to see if she could not put her knowledge of the workings of the human mind at the service of those whose minds were acting in a way not entirely healthy and normal. * * * She believed that psychology, being at the foundation of all human life, ought to be understood and used. A knowledge of its laws would help people to learn how to live. * * * 'Every day I am impressed by the need in modern life of a confessional conducted along scientific lines.' * * * Many

of the cases were so baffling that they required on the part of the expert a great deal of time and patience. * * * Dr. Martin refers to her work as 'personal mental hygiene.' * * * She looks forward to the time when it will be put on a level in the schools with physical hygiene and when the laws now known in regard to memory attention, suggestion, habit, and fatigue will be made clear to the young for their intellectual and emotional guidance."

Dr. William Healy, one of the Cooperating Editors of the JOURNAL and at present Director of the Juvenile Psychopathic Institute in Chicago, is to assume the Directorship of the Judge Baker Foundation of the Juvenile Court in Boston, Mass.

The cause of applied psychology has recently suffered a great loss in the sudden death of Professor Hugo Münsterberg of Harvard University. While lecturing to a class of Radcliff students, on December 16, 1916, he was stricken and after a few minutes succumbed without regaining consciousness. For several years he had been conducting experimental investigations in various fields of applied psychology, and his public addresses and numerous articles in popular magazines as well as his books have greatly helped to spread far and wide the present interest in psychology and its practical applications. One of his last efforts was in behalf of The Journal of Applied Psychology, as he had gladly consented to become one of its cooperating editors. His originality in thought, his keen sense for systematic organization of new psychological results, his deep philosophical appreciation of all scientific advances, and his ability to express in fascinating language the newly discovered truths of mental life have earned him a position of highest rank in the psychological world.

THE EDITORS.